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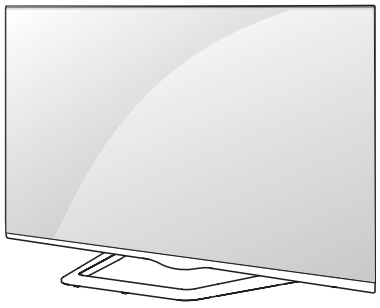
LED TV
SERVICE MANUAL

CHASSIS : LD34D

MODEL: 47LA86** 47LA860**-Z*

CAUTION
BEFORE SERVICING THE CHASSIS,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



P/NO : MFL67733206 (1303-REV00)

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SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and Exploded View.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and it's components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

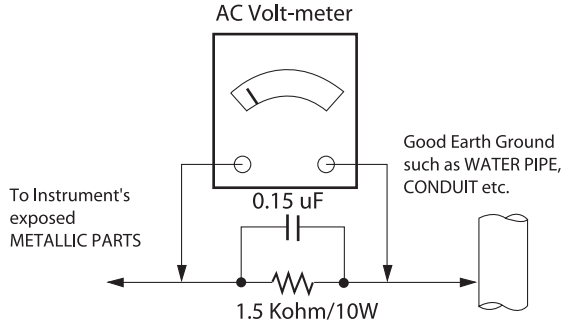
always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)
With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.
If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 MΩ and 5.2 MΩ.
When the exposed metal has no return path to the chassis the reading must be infinite.
An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)
Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.
Connect 1.5 K / 10 watt resistor in parallel with a 0.15 uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.
Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.
Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which is corresponds to 0.5 mA.
In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω
*Base on Adjustment standard

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SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the *SAFETY PRECAUTIONS* on page 3 of this publication.
NOTE: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;
   a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
   b. Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
   CAUTION: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe. Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)
   CAUTION: This is a flammable mixture.
   Unless specified otherwise in this service manual, lubrication of contacts in not required.
5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
6. Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
7. Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
   Always remove the test receiver ground lead last.
8. Use with this receiver only the test fixtures specified in this service manual.
   CAUTION: Do not connect the test fixture ground strap to any heat sink in this receiver.

Electrostatically Sensitive (ES) Devices

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor “chip” components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static type solder removal device. Some solder removal devices not classified as “anti-static” can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range or 500 °F to 600 °F.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle. Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
   a. Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
   b. Heat the component lead until the solder melts.
   c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
   a. Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
   b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
   c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
   d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

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IC Remove/Replacement
Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal
1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

Replacement
1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

"Small-Signal" Discrete Transistor Removal/Replacement
1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device
Removal/Replacement
1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement
1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor
Removal/Replacement
1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.
   CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair
Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

At IC Connections
To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections
Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.
   CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

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SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

1. Application range

This specification is applied to the LED TV used LD34D chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

1) Temperature: 25 °C ± 5 °C(77 °F ± 9 °F), CST: 40 °C ± 5 °C
2) Relative Humidity: 65 % ± 10 %
3) Power Voltage
   : Standard input voltage (AC 100-240 V~, 50/60 Hz)
   * Standard Voltage of each products is marked by models.
4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
5) The receiver must be operated for about 20 minutes prior to the adjustment.

3. Test method

1) Performance: LGE TV test method followed
2) Demanded other specification
   - Safety : CE, IEC specification
   - EMC : CE, IEC
   - Wireless : Wireless HD Specification (Option)

4. Model General Specification

No.	Item	Specification	Remarks
1	Market	EU(PAL Market-36Countries)/CIS + Morocoo(Africa)	**DTV & Analog (Total 37 countries)** **DTV (MPEG2/4, DVB-T) : 30 countries** Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus **DTV (MPEG2/4, DVB-T2) : 8 countries** UK(Ireland), Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan, Russia **DTV (MPEG2/4, DVB-C) : 37 countries** Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan **DTV (MPEG2/4, DVB-S/S2) : 30 countries** Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan **Supported satellite : 29 satellites** ABS1 75.0E/ AMOS 4.0W/ ASIASATS 105.5E/ ASTRA1LHMKR 19.2E/ ASTRA2ABD 28.2E/ ASTRA3AB 23.5E/ ASTRA4A 4.8E/ ATLANTICBIRD2 8.0W/ ATLANTICBIRD3 5.0W/ BADR 26.0E/ EUROBIRD3 33.0E/ EUROBIRD9A 9.0E/ EUTELSATW2A 10.E/ EUTELSATW3A 7.0E/ EUTELSATW4W7 36.0E/ EUTELSESAT 16.0E/ EXPRESSAM1 40.0E/ EXPRESAM3 140.0E/ EXPRESSAM33 96.5E/ HELLASAT2 39.0E/ HISPASAT1CDE 30.0W/ HOTBIRD 13.0E/ INTELSAT10&7 68.5E/ INTELSAT15 85.2E/ INTELSAT904 60.0E/ NILESAT 7.0W/ THOR 0.8W/ TURKSAT 42.0E/ YAMAL201 90.0E

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No.	Item	Specification	Remarks
2	Broadcasting system	1) PAL-BG/DK/I/I' 2) SECAM L/L', DK, BG, I 3) DVB-T/T2, C, S/S2	
3	Program coverage	1) Digital TV - VHF, UHF - C-Band, Ku-Band 2) Analogue TV -VHF : E2 to E12 -UHF : E21 to E69 -CATV : S1 to S20 -HYPER : S21 to S47	
4	Receiving system	Analog : Upper Heterodyne Digital : COFDM, QAM	► DVB-T - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32 - Modulation : Code Rate QPSK : 1/2, 2/3, 3/4, 5/6, 7/8 16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 ► DVB-T2 - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256, - Modulation : Code Rate QPSK : 1/2, 2/5, 2/3, 3/4, 5/6 16-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 64-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 256-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 ► DVB-C - Symbolrate : 4.0Msymbols/s to 7.2 Msymbols/s - Modulation : 16QAM, 64-QAM, 128-QAM and 256-QAM ► DVB-S/S2 - symbolrate : DVB-S2 (8PSK / QPSK) : 2 ~ 45 Msymbol/s DVB-S (QPSK) : 2 ~ 45 Msymbol/s - viterbi DVB-S mode : 1/2, 2/3, 3/4, 5/6, 7/8 DVB-S2 mode : 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9, 9/10
5	Input Voltage	AC 100 ~ 240 V, 50/60 Hz	

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5. External input format

5.1. 2D Mode

(1) Component input(Y, CB/PB, CR/PR)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	
1.	720×480	15.73	60.00	SDTV, DVD 480i
2.	720×480	15.63	59.94	SDTV, DVD 480i
3.	720×480	31.47	59.94	480p
4.	720×480	31.50	60.00	480p
5.	720×576	15.625	50.00	SDTV 576i
6.	720×576	31.25	50.00	SDTV 576p
7.	1280×720	45.00	50.00	HDTV 720p
8.	1280×720	44.96	59.94	HDTV 720p
9.	1280×720	45.00	60.00	HDTV 720p
10.	1920×1080	31.25	50.00	HDTV 1080i
11.	1920×1080	33.75	60.00	HDTV 1080i
12.	1920×1080	33.72	59.94	HDTV 1080i
13.	1920×1080	56.250	50	HDTV 1080p
14.	1920×1080	67.5	60	HDTV 1080p

(2) HDMI Input (PC/DTV)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	VIC	Proposed	
HDMI-PC							DDC
1	640*350	31.468	70.09	25.17		EGA	X
2	720*400	31.469	70.08	28.32		DOS	O
3	640*480	31.469	59.94	25.17		VESA(VGA)	O
4	800*600	37.879	60.31	40.00		VESA(SVGA)	O
5	1024*768	48.363	60.00	65.00		VESA(XGA)	O
6	1152*864	54.348	60.053	80		VESA	
7	1280*1024	63.981	60.020	108		VESA(SXGA)	O
8	1360*768	47.712	60.015	85.5		VESA(WXGA)	O
9	1920*1080	67.5	60.00	148.5		WUXGA(CEA861D)	O
HDMI-DTV							
1	640*480	31.469 / 31.5	59.94/ 60	25.125	1	SDTV 480P	
2	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	2,3	SDTV 480P	
3	720*576	31.25	50	27	17,18	SDTV 576P	
4	720*576	15.625	50	27	21	SDTV 576I	
5	1280*720	37.500	50	74.25	19	HDTV 720P	
6	1280*720	44.96 / 45	59.94 / 60	74.17/74.25	4	HDTV 720P	
7	1920*1080	33.72 / 33.75	59.94 / 60	74.17/74.25	5	HDTV 1080I	
8	1920*1080	28.125	50.00	74.25	20	HDTV 1080I	
9	1920*1080	26.97 / 27	23.97 / 24	74.17/74.25	32	HDTV 1080P	
10	1920*1080		25		33	HDTV 1080P	
11	1920*1080	33.716 / 33.75	29.976 / 30.00	74.25	34	HDTV 1080P	
12	1920*1080	56.250	50	148.5	31	HDTV 1080P	
13	1920*1080	67.43 / 67.5	59.94 / 60	148.35/148.50	16	HDTV 1080P	

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5.2. 3D Mode

(1) RF Input(3D supported mode manually)

No.	Resolution	Proposed	3D input proposed mode
1	HD - DTV	1080I 720P	2D to 3D Side by Side(Half) Top & Bottom
2	SD - DTV	576P 576I	
3	SD - ATV(CVBS/SCART)		

(2) RF Input(3D supported mode automatically)

No.	Signal	3D input proposed mode
1	Frame Compatible	Side by Side(Half), Top & Bottom

(3) HDMI 1.3 (3D supported mode manually)

No	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	3D input proposed mode
1	720*480	31.5	60	27.03	SDTV 480P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Frame Sequential, Row Interleaving, Column Interleaving
2	720*576	31.25	50	27	SDTV 576P	
3	1280*720	45.00	60.00	74.25	HDTV 720P	
4	1280*720	37.500	50	74.25	HDTV 720P	
5	1920*1080	33.75	60.00	74.25	HDTV 1080I	2D to 3D, Side by Side(Half), Top & Bottom
6	1920*1080	28.125	50.00	74.25	HDTV 1080I	
7	1920*1080	27.00	24.00	74.25	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving
8	1920*1080	28.12	25	74.25	HDTV 1080P	
9	1920*1080	33.75	30.00	74.25	HDTV 1080P	
10	1920*1080	67.50	60.00	148.5	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving
11	1920*1080	56.250	50	148.5	HDTV 1080P	

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(4) HDMI 1.4b (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	VIC	3D input proposed mode	Proposed
1	640*480	31.469 / 31.5	59.94/ 60	25.125/25.2	1	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
2		62.938/63	59.94/ 60	50.35/50.4	1	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
3		31.469 / 31.5	59.94/ 60	50.35/50.4	1	Side-by-side(Full)	(SDTV 480P)
4	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	2,3	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
5		62.938/63	59.94 / 60	54/54.06	2,3	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
6		31.469 / 31.5	59.94 / 60	54/54.06	2,3	Side-by-side(Full)	(SDTV 480P)
7	720*576	31.25	50	27	17,18	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 576P) Secondary(SDTV 576P)
8		62.5	50	54	17,18	Frame packing Line alternative	Secondary(SDTV 576P) (SDTV 576P)
9		31.25	50	54	17,18	Side-by-side(Full)	(SDTV 576P)
10	1280*720	37.500	50	74.25	19	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
11		75	50	148.5	19	Frame packing Field alternative	Primary(HDTV 720P) (HDTV 720P)
12		37.500	50	148.5	19	Side-by-side(Full)	(HDTV 720P)
13		44.96 / 45	59.94 / 60	74.18/74.25	4	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
14		89.91/90	59.94 / 60	148.35/148.5	4	Frame packing Line alternative	Primary(HDTV 720P) (HDTV 720P)
15		44.96 / 45	59.94 / 60	148.35/148.5	4	Side-by-side(Full)	(HDTV 720P)
16	1920*1080	33.72 / 33.75	59.94 / 60	74.18/74.25	5	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
17		67.432/67.50	59.94 / 60	148.35/148.5	5	Frame packing Line alternative	Primary(HDTV 1080I) (HDTV 1080I)
18		33.72 / 33.75	59.94 / 60	148.35/148.5	5	Side-by-side(Full)	(HDTV 1080I)
19		28.125	50.00	74.25	20	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
20		56.25	50.00	148.5	20	Frame packing Field alternative	Primary(HDTV 1080I) (HDTV 1080I)
21		28.125	50.00	148.5	20	Side-by-side(Full)	(HDTV 1080I)
22		26.97 / 27	23.97 / 24	74.18/74.25	32	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
23		43.94/54	23.97 / 24	148.35/148.5	32	Frame packing Field alternative	Primary(HDTV 1080P) (HDTV 1080P)
24		26.97 / 27	23.97 / 24	148.35/148.5	32	Side-by-side(Full)	(HDTV 1080P)
25		28.12	25	74.25	33	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
26		56.24	25	148.5	33	Frame packing Line alternative	Primary(HDTV 1080P) (HDTV 1080P)
27		28.12	25	148.5	33	Side-by-side(Full)	(HDTV 1080P)
28		33.716 / 33.75	29.976 / 30.00	74.18/74.25	34	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080P) Secondary(HDTV 1080P)
29		67.432 / 67.5	29.976 / 30.00	148.35/148.5	34	Frame packing Line alternative	Secondary(HDTV 1080P) (HDTV 1080P)
30		33.716 / 33.75	29.976 / 30.00	148.35/148.5	34	Side-by-side(Full)	(HDTV 1080P)
31		56.250	50	148.5	31	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)
32		67.43 / 67.5	59.94 / 60	148.35/148.50	16	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)

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(5) HDMI-PC Input (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode	Proposed
1	1024*768	48.36	60	65	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
2	1360*768	47.71	60	85.5	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
3	1920*1080	67.500	60	148.50	2D to 3D, Side by Side(half) Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving	HDTV 1080P
4	Others	-	-	-	2D to 3D	640*350 720*400 640*480 800*600 1152*864

(6) Component Input (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock	3D input proposed mode	Proposed
1	1280*720	37.5	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
2	1280*720	45.00	60.00	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
3	1280*720	44.96	59.94	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
4	1920*1080	33.75	60.00	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
5	1920*1080	33.72	59.94	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
6	1920*1080	28.12	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
7	1920*1080	67.500	60	148.50	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
8	1920*1080	67.432	59.94	148.352	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
9	1920*1080	27.000	24.000	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
10	1920*1080	28.12	25	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
11	1920*1080	56.25	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
12	1920*1080	26.97	23.976	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
13	1920*1080	33.75	30.000	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
14	1920*1080	33.71	29.97	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P

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(7) USB, DLNA – Movie (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	Under 704x480				2D to 3D
2	Over 704x480 interlaced				2D to 3D, Side by Side(Half), Top & Bottom
3	Over 704x480 progressive		50 / 60		2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving, Frame Sequential
4			others		2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving

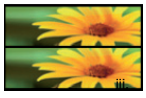
(8) USB, DLNA -Photo (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	Under 320x240	-	-	-	2D to 3D
2	Over 320x240	-	-	-	2D to 3D, Side by Side(Half), Top & Bottom

(9) USB, DLNA (3D) (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	1080p	33.75	30	74.25	Side by Side(Half), Top & Bottom, Checker Board, MPO(Photo), JPS(Photo)

■ Remark: 3D Input mode

No.	Side by Side	Top & Bottom	Checker board	Single Frame Sequential	Frame Packing	Line Interleaving	Column Interleaving	2D to 3D
1								

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ADJUSTMENT INSTRUCTION

1. Application Range

This specification sheet is applied to all of the LED TV with LD34D chassis.

2. Designation

(1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test instrument.
(2) Adjustment must be done in the correct order.
(3) The adjustment must be performed in the circumstance of 25 °C ± 5 °C of temperature and 65 % ± 10 % of relative humidity if there is no specific designation.
(4) The input voltage of the receiver must keep AC 100-240 V~, 50/60 Hz.
(5) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15.

In case of keeping module is in the circumstance of 0 °C, it should be placed in the circumstance of above 15 °C for 2 hours.

In case of keeping module is in the circumstance of below -20 °C, it should be placed in the circumstance of above 15 °C for 3 hours.

[Caution]
When still image is displayed for a period of 20 minutes or longer (Especially where W/B scale is strong. Digital pattern 13ch and/or Cross hatch pattern 09ch), there can some afterimage in the black level area.

3. Automatic Adjustment

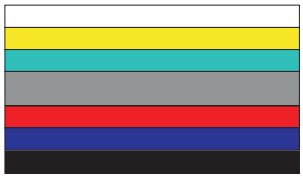
3.1. ADC Adjustment

3.1.1. Overview

ADC adjustment is needed to find the optimum black level and gain in Analog-to-Digital device and to compensate RGB deviation.

3.1.2. Equipment & Condition

(1) USB to RS-232C Jig
(2) MSPG-925 Series Pattern Generator(MSPG-925FA, pattern - 65)
- Resolution : 480i Comp1
  1080P Comp1
  1920*1080P SCART RGB
- Pattern : Horizontal 100% Color Bar Pattern
- Pattern level : 0.7 ± 0.1 Vp-p
- Image



3.1.3. Adjustment

(1) Adjustment method
- Using RS-232, adjust items in the other shown in "3.1.3.3)"

(2) Adj. protocol

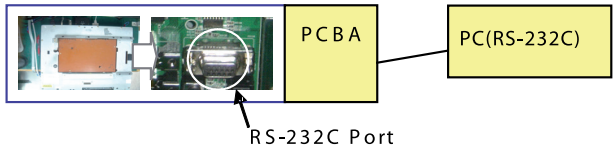
Protocol	Command	Set ACK
Enter adj. mode	aa 00 00	a 00 OK00x
Source change	xb 00 04 xb 00 06	b 00 OK04x (Adjust 480i, 1080p Comp1) b 00 OK06x (Adjust 1920*1080 SCART RGB)
Begin adj.	ad 00 10	
Return adj. result		OKx (Case of Success) NGx (Case of Fail)
Read adj. data	(main) ad 00 20	(main) 00000000000000000000000007c007b006dx
	(sub) ad 00 21	(Sub) 00000007000000000000000007c00830077x
Confirm adj.	ad 00 99	NG 03 00x (Fail) NG 03 01x (Fail) NG 03 02x (Fail) OK 03 03x (Success)
End adj.	aa 00 90	a 00 OK90x

Ref.) ADC Adj. RS232C Protocol_Ver1.0

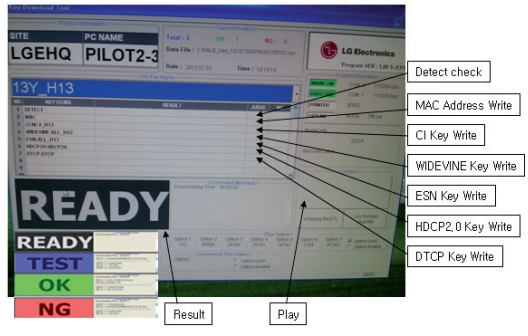
(3) Adj. order
- aa 00 00 [Enter ADC adj. mode]
- xb 00 04 [Change input source to Component1 (480i& 1080p)]
- ad 00 10 [Adjust 480i&1080p Comp1]
- xb 00 06 [Change input source to RGB(1024*768)]
- ad 00 10 [Adjust 1920*1080 SCART RGB]
- ad 00 90 End adj.

3.2. MAC address D/L, CI+ key D/L, Widevine key D/L, ESN key D/L, HDCP key D/L, DTCP key D/L

Connect: PCBA Jig → RS-232C Port== PC → RS-232C Port
Communication Prot connection



- Com 1,2,3,4 and 115200(Baudrate)
  Mode check: Online Only
- Check the test process: DETECT → MAC → CI → Widevine → ESN → HDCP → DTCP
- Play: START
- Result: Ready, Test, OK or NG
- Printer Out (MAC Address Label)



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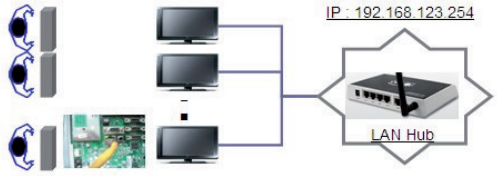
3.3. LAN Inspection

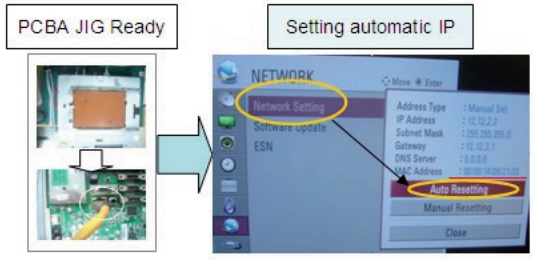
3.3.1. Equipment & Condition

▪ Each other connection to LAN Port of IP Hub and Jig



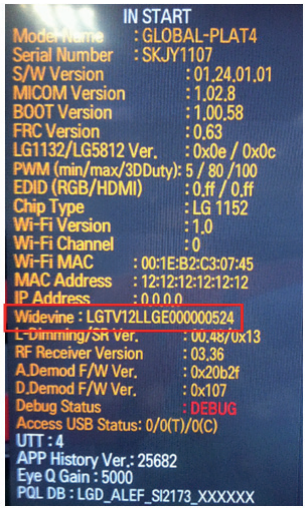
3.3.2. LAN inspection solution

▪ LAN Port connection with PCB
▪ Network setting at MENU Mode of TV
▪ Setting automatic IP
▪ Setting state confirmation
→ If automatic setting is finished, you confirm IP and MAC Address.



3.3.3. WIDEVINE key Inspection

- Confirm key input data at the "IN START" MENU Mode.


IN START
Model Name : GLOBAL-PLAT4
Serial Number : SKJY1107
S/W Version : 01.24.01.01
MICOM Version : 1.02.8
BOOT Version : 1.00.58
FRC Version : 0.63
LG1132/LG5812 Ver. : 0x0e / 0x0c
PWM (min/max/3DDuty): 5 / 80 /100
EDID (RGB/HDMI) : 0.ff / 0.ff
Chip Type : LG 1152
Wi-Fi Version : 1.0
Wi-Fi Channel : 0
Wi-Fi MAC : 00:1E:B2:C3:07:45
MAC Address : 12:12:12:12:12:12
IP Address : 0.0.0.0
Widevine : LGTV12LLGE000000524
L-Dimming/SR Ver. : 00.48/0x13
RF Receiver Version : 03.36
A.Demod F/W Ver. : 0x20b2f
D.Demod F/W Ver. : 0x107
Debug Status : DEBUG
Access USB Status: 0/0(T)/0(C)
UTT : 4
APP History Ver.: 25682
Eye Q Gain : 5000
PQL DB : LGD_ALEF_SI2173_XXXXXX

3.4. LAN PORT INSPECTION(PING TEST)

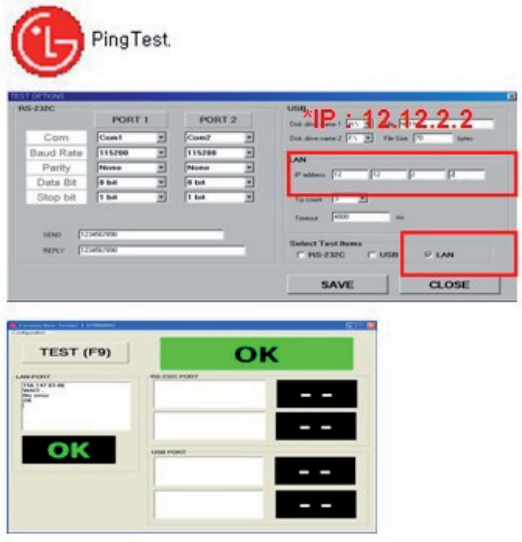
Connect SET → LAN port == PC → LAN Port

3.4.1. Equipment setting

(1) Play the LAN Port Test PROGRAM.
(2) Input IP set up for an inspection to Test Program.
*IP Number : 12.12.2.2

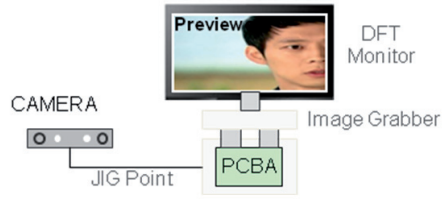
3.4.2. LAN PORT inspection(PING TEST)

(1) Play the LAN Port Test Program.
(2) Connect each other LAN Port Jack.
(3) Play Test (F9) button and confirm OK Message.
(4) Remove LAN cable.



3.5. Camera Port Inspection

(1) Objective : To check PCBA's CAMERA Port.
(2) How-it-works
1) Connect the PCBA like below Picture.
2) Send specific RS-232C command for displaying Camera Preview.
* CAMERA need to be status of Slide up.



3) RS-232C Command

RS-232C COMMAND			Explanation
CMD	DATA	ID	
ai	00	23	Camera Function Start.
ai	00	24	Camera Function End.

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3.6. Model name & Serial number Download

3.6.1. Model name & Serial number D/L

- Press "Power on" key of service remote control. (Baud rate : 115200 bps)
- Connect RS-232C Signal to USB Cable to USB.
- Write Serial number by use USB port.
- Must check the serial number at Instart menu.

3.6.2. Method & notice

(1) Serial number D/L is using of scan equipment.
(2) Setting of scan equipment operated by Manufacturing Technology Group.
(3) Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.

* Manual Download (Model Name and Serial Number)
If the TV set is downloaded by OTA or service man, sometimes model name or serial number is initialized.(Not always)
It is impossible to download by bar code scan, so It need Manual download.
1) Press the "Instart" key of Adjustment remote control.
2) Go to the menu "7.Model Number D/L" like below photo.
3) Input the Factory model name(ex 47LM960V-ZB) or Serial number like photo.

4) Check the model name Instart menu. → Factory name displayed. (ex 47LM960V-ZB)
5) Check the Diagnostics.(DTV country only) → Buyer model displayed. (ex 47LM960V-ZB)

3.7. CI+ Key checking method

* Check the Section 3.2
Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).

=> Check the Download to CI+ Key value in LGset.

3.7.1. Check the method of CI+ Key value

(1) Check the method on Instart menu
(2) Check the method of RS232C Command
1) Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0	
A	A	0	0

2) Check the key download for transmitted command (RS232: ci 00 10)

CMD 1	CMD 2	Data 0	
C	I	1	0

3) Result value
- Normally status for download : OKx
- Abnormally status for download : NGx

3.7.2. Check the method of CI+ key value(RS232)

1) Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0	
A	A	0	0

2) Check the mothed of CI+ key by command (RS232: ci 00 20)

CMD 1	CMD 2	Data 0	
C	I	2	0

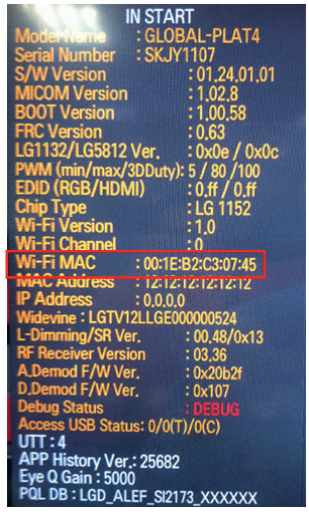
3) Result value
i 01 OK 1d1852d21c1ed5dcx
→ CI+ Key Value

3.8. WIFI MAC ADDRESS CHECK

(1) Using RS232 Command

	H-freq(kHz)	V-freq.(Hz)
Transmission	[A][I][][Set ID][][20][Cr]	[O][K][X] or [NG]

(2) Check the menu on in-start


IN START
Model Name : GLOBAL-PLAT4
Serial Number : SKJY1107
S/W Version : 01.24.01.01
MICOM Version : 1.02.8
BOOT Version : 1.00.58
FRC Version : 0.63
LG1132/LG5812 Ver. : 0x0e / 0x0c
PWM (min/max/3DDuty): 5 / 80 /100
EDID (RGB/HDMI) : 0.ff / 0.ff
Chip Type : LG 1152
Wi-Fi Version : 1.0
Wi-Fi Channel : 0
Wi-Fi MAC : 00:1E:B2:C3:07:45
MAC Address : 12:12:12:12:12:12
IP Address : 0.0.0.0
Widevine : LGTV12LLGE000000524
L-Dimming/SR Ver. : 00.48/0x13
RF Receiver Version : 03.36
A.Demod F/W Ver. : 0x20b2f
D.Demod F/W Ver. : 0x107
Debug Status : DEBUG
Access USB Status: 0/0(T)/0(C)
UTT : 4
APP History Ver.: 25682
Eye Q Gain : 5000
PQL DB : LGD_ALEF_SI2173_XXXXXX

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4. Manual Adjustment

* ADC adjustment is not needed because of OTP(Auto ADC adjustment)

4.1. EDID(The Extended Display Identification Data)/DDC(Display Data Channel) download

4.1.1. Overview

It is a VESA regulation. A PC or a MNT will display an optimal resolution through information sharing without any necessity of user input. It is a realization of "Plug and Play".

4.1.2. Equipment

- Since embedded EDID data is used, EDID download JIG, HDMI cable and D-sub cable are not need.
- Adjustment remote control

4.1.3. Download method

(1) Press "ADJ" key on the Adjustment remote control then select "10.EDID D/L", By pressing "Enter" key, enter EDID D/L menu.

(2) Select "Start" button by pressing "Enter" key, HDMI1/ HDMI2/ HDMI3/ HDMI4/ RGB are writing and display OK or NG.

For HDMI EDID	
DVI-D to HDMI or HDMI to HDMI	

4.1.4. EDID DATA

▪ HDMI

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	ⓐ		ⓑ			
0x01	ⓒ		01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
0x02	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
0x03	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
0x04	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
0x05	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
0x06	3E	1E	53	10	00	0A	20	20	20	20	20	20	ⓓ			
0x07	ⓓ														01	ⓔ1
0x00	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
0x01	22	15	01	29	3D	06	C0	15	07	50	09	57	07	ⓕ		
0x02	ⓕ															
0x03	ⓕ					E3	05	03	01	02	3A	80	18	71	38	40
0x04	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
0x05	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
0x06	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
0x07	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	ⓔ2

▪ Reference

- HDMI1 ~ HDMI4
- In the data of EDID, bellows may be different by S/W or Input mode.

ⓐ Product ID

MODEL NAME	HEX	EDID Table	DDC Function
HD/FHD Model	0001	01 00	Analog/Digital

ⓑ Serial No: Controlled on production line.

ⓒ Month, Year: Controlled on production line:
ex) Monthly : '01' → '01', Year : '2013' → '17'

ⓓ Model Name(Hex): LGTV
Cf) TV set's model name in EDID data is below.

MODEL NAME	MODEL NAME(HEX)
LG TV	00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20 (LG TV)

ⓔ Checksum(LG TV): Changeable by total EDID data.

EDID C/S data		FHD
		HDMI
check sum (Hex)	Block 0	42
	Block 1	23 (HDMI1)
		13 (HDMI2)

ⓕ Vendor Specific(HDMI)

INPUT	MODEL NAME(HEX)
HDMI1	78030C001000801E
HDMI2	78030C002000801E

(1) EDID

HDMI 1(C/S : E8 81)

EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
90	22	15	01	29	3D	06	C0	15	07	50	09	57	07	78	03	0C
A0	00	10	00	B8	2D	20	C0	0E	01	4F	3F	FC	08	10	18	10
B0	06	10	16	10	28	10	E3	05	03	01	02	3A	80	18	71	38
C0	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
D0	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
E0	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	81

HDMI 2(C/S : E8 71)

EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

EDID Block 1, Bytes 128-255 [80H-FFH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	37	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
10	22	15	01	26	15	07	50	09	57	07	78	03	0C	00	20	00
20	B8	2D	20	C0	0E	01	4F	3F	FC	08	10	18	10	06	10	16
30	10	28	10	E3	05	03	01	02	3A	80	18	71	38	2D	40	58
40	2C	45	00	A0	5A	00	00	00	1E	01	1D	80	18	71	1C	16
50	20	58	2C	25	00	A0	5A	00	00	00	9E	01	1D	00	72	51
60	D0	1E	20	6E	28	55	00	A0	5A	00	00	00	1E	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	01

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HDMI 3(C/S : E8 61)

EDID Block 0, Bytes 0-127 [00H-7FH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

EDID Block 1, Bytes 128-255 [80H-FFH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
10	22	15	01	29	3D	06	C0	15	07	50	09	57	07	78	03	0C
20	00	30	00	B8	2D	20	C0	0E	01	4F	3F	FC	08	10	18	10
30	06	10	16	10	28	10	E3	05	03	01	02	3A	80	18	71	38
40	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
50	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
60	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	61

HDMI 4(C/S : E8 51)

EDID Block 0, Bytes 0-127 [00H-7FH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

EDID Block 1, Bytes 128-255 [80H-FFH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
10	22	15	01	29	3D	06	C0	15	07	50	09	57	07	78	03	0C
20	00	40	00	B8	2D	20	C0	0E	01	4F	3F	FC	08	10	18	10
30	06	10	16	10	28	10	E3	05	03	01	02	3A	80	18	71	38
40	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
50	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
60	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	51

4.2. White Balance Adjustment

4.2.1. Overview

▪ W/B adj. Objective & How-it-works

(1) Objective: To reduce each Panel's W/B deviation

(2) How-it-works : When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.

(3) Adjustment condition : normal temperature

1) Surrounding Temperature : 25 °C ± 5 °C

2) Warm-up time: About 5 Min

3) Surrounding Humidity : 20 % ~ 80 %

4.2.2. Equipment

(1) Color Analyzer: CA-210 (LED Module : CH 14)

(2) Adjustment Computer(During auto adj., RS-232C protocol is needed)

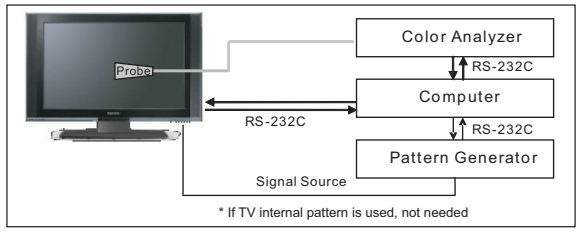
(3) Adjustment Remote control

(4) Video Signal Generator MSPG-925F 720p/216-Gray (Model: 217, Pattern: 78)

→ Only when internal pattern is not available

▪ Color Analyzer Matrix should be calibrated using CS-100.

4.2.3. Equipment connection MAP



4.2.4. Adj. Command (Protocol)

<Command Format>

START	6E	A	50	A	LEN	A	03	A	CMD	A	00	A	VAL	A	CS	STOP

- LEN: Number of Data Byte to be sent
- CMD: Command
- VAL: FOS Data value
- CS: Checksum of sent data
- A: Acknowledge

Ex) [Send: JA_00_DD] / [Ack: A_00_okDDX]

▪ RS-232C Command used during auto-adjustment.

RS-232C COMMAND [CMD	ID	DATA]	Explantion
wb	00	00	Begin White Balance adjustment
wb	00	10	Gain adjustment(internal white pattern)
wb	00	1f	Gain adjustment completed
wb	00	20	Offset adjustment(internal white pattern)
wb	00	2f	Offset adjustment completed
wb	00	ff	End White Balance adjustment (internal pattern disappears)

Ex) wb 00 00 -> Begin white balance auto-adj.
wb 00 10 -> Gain adj.
ja 00 ff -> Adj. data
jb 00 c0
...
...
wb 00 1f → Gain adj. completed
*(wb 00 20(Start), wb 00 2f(end)) → Off-set adj.
wb 00 ff → End white balance auto-adj.

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▪ Adj. Map

	Adj. item	Command (lower caseASCII)		Data Range (Hex.)		Default (Decimal)
		CMD1	CMD2	MIN	MAX	
Cool	R Gain	j	g	00	C0	
	G Gain	j	h	00	C0	
	B Gain	j	i	00	C0	
	R Cut					
	G Cut					
	B Cut					
Medium	R Gain	j	a	00	C0	
	G Gain	j	b	00	C0	
	B Gain	j	c	00	C0	
	R Cut					
	G Cut					
	B Cut					
Warm	R Gain	j	d	00	C0	
	G Gain	j	e	00	C0	
	B Gain	j	f	00	C0	
	R Cut					
	G Cut					

4.2.5. Adj. method

(1) Auto adj. method

1) Set TV in adj. mode using POWER ON key.
2) Zero calibrate probe then place it on the center of the Display.
3) Connect Cable.(RS-232C to USB)
4) Select mode in adj. Program and begin adj.
5) When adj. is complete (OK Sign), check adj. status pre mode. (Warm, Medium, Cool)
6) Remove probe and RS-232C cable to complete adj.

▪ W/B Adj. must begin as start command “wb 00 00” , and finish as end command “wb 00 ff”, and Adj. offset if need.

(2) Manual adjustment. method

1) Set TV in Adj. mode using POWER ON.
2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10 cm of the surface.
3) Press ADJ key → EZ adjust using adj. R/C → 9. White-Balance then press the cursor to the right(key ►). When right key(►) is pressed 216 Gray internal pattern will be displayed
4) Adjust Cool modes
   a. Fix the one of R/G/B gain to 192 (default data) and decrease the others. (If G gain is adjusted over 172 and R and B gain less than 192 , Adjust is O.K.)
   b. If G gain is less than 172, Increase G gain by up to 172, and then increase R gain and G gain same amount of increasing G gain.
   c. If R gain or B gain is over 255, Readjust G gain less than 172, Conform to R gain is 255 or B gain is 255
5) Adjust two modes(Medium/Warm) Fix the one of R/G/B gain to 192(default data) and decrease the others.
6) Adj. is completed, Exit adjust mode using “EXIT” key on Remote controller.

▪ If internal pattern is not available, use RF input. In EZ Adj. menu 6.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 206 Gray pattern.

* CASE Cool

First adjust the coordinate far away from the target value(x, y).

1. x, y > target
   i) Decrease the R, G.
2. x, y < target
   i) First decrease the B gain,
3. x > target, y < target
   i) First decrease B, so make y a little more than the target.
   ii) Adjust x value by decreasing the R
4. x < target, y > target
   i) First decrease B, so make x a little more than the target.
   ii) Adjust x value by decreasing the G

How to adjust

1. If G gain is adjusted over 172 and R gain and B gain less than 192 , Adjust is O.K.
2. If G gain is less than 172 , increase G gain by up to 172, and then increase R gain and B gain same amount of increasing G gain.
3. If R gain or B gain is over 255 , Readjust G gain less than 172, Conform to R gain is 255 or B gain is 255

* CASE Medium / Warm

First adjust the coordinate far away from the target value(x, y).

1. x, y > target
   i) Decrease the R, G.
2. x, y < target
   i) First decrease the B gain,
   ii) Decrease the one of the others.
3. x > target, y < target
   i) First decrease B, so make y a little more than the target.
   ii) Adjust x value by decreasing the R
4. x < target, y > target
   i) First decrease B, so make x a little more than the target.
   ii) Adjust y value by decreasing the G

▪ Adjustment condition and cautionary items

1) Lighting condition in surrounding area
   Surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
2) Probe location
   : Color Analyzer(CA-210) probe should be within 10 cm and perpendicular of the module surface (80° ~ 100°)
3) Aging time
   - After Aging Start, Keep the Power ON status during 5 Minutes.
   - In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

4.2.6. Reference (White balance Adj. coordinate and color temperature)

▪ Luminance : 206 Gray
▪ Standard color coordinate and temperature using CS-1000 (over 26 inch)

Mode	Coordinate		Temp	Δuv
	x	y		
Cool	0.271	0.270	13000 K	0.0000
Medium	0.285	0.293	9300 K	0.0000
Warm	0.310	0.325	6500 K	0.0000

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▪ Standard color coordinate and temperature using CA-210(CH 18)

Mode	Coordinate		Temp	Δuv
	x	y		
Cool	0.271±0.002	0.270±0.002	13000K	0.0000
Medium	0.285±0.002	0.293±0.002	9300K	0.0000
Warm	0.310±0.002	0.325±0.002	6500K	0.0000

4.2.7. EDGE LED White balance table

(1) EDGE LED module change color coordinate because of aging time.
(2) Apply under the color coordinate table, for compensated aging time.
(3) Normal line(Edge)
- Gumi (Mar ~ Dec) & Global

GP4	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	285	293	313	329
1	0-2	281	287	295	310	320	342
2	3-5	280	285	294	308	319	340
3	6-9	278	284	292	307	317	339
4	10-19	276	281	290	304	315	336
5	20-35	275	277	289	300	314	332
6	36-49	274	274	288	297	313	329
7	50-79	273	272	287	295	312	327
8	80-119	272	271	286	294	311	326
9	Over 120	271	270	285	293	310	325

(4) Aging Chamber(Edge)

GP4	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	285	293	313	329
1	0-5	280	285	294	308	319	340
2	6-10	276	280	290	303	315	335
3	11-20	272	275	286	298	311	330
4	21-30	269	272	283	295	308	327
5	31-40	267	268	281	291	306	323
6	41-50	266	265	280	288	305	320
7	51-80	265	263	279	286	304	318
8	81-119	264	261	278	284	303	316
9	Over 120	264	260	278	283	303	315

4.3. Local Dimming Function Check

Step 1) Turn on TV.
Step 2) At the Local Dimming mode, module Edge Backlight moving right to left Back light of IOP module moving.
Step 3) Confirm the Local Dimming mode.
Step 4) Press "exit" key.

Local Dimming Demo.
(Edge LED Model)

4.4. Magic Motion Remote control test

(1) Equipment : RF Remote control for test, IR-KEY-Code Remote control for test
(2) You must confirm the battery power of RF-Remote control before test(recommend that change the battery per every lot)
(3) Sequence (test)
1) if you select the "Start(Mute)" key on the Adjustment remote control, you can pairing with the TV SET.
2) You can check the cursor on the TV Screen, when select the "OK" key on the Adjustment remote control.
3) You must remove the pairing with the TV Set by select "OK" key + "Mute" key on the Adjustment remote control for 5 seconds.

4.5. 3D function test

(Pattern Generator MSHG-600, MSPG-6100[Support HDMI1.4])
* HDMI mode NO. 872 , pattern No.83
(1) Please input 3D test pattern like below.

(2) When 3D OSD appear automatically, then select OK key.

(3) Don't wear a 3D Glasses, check the picture like below.

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4.6. Wi-Fi Test

Step 1) Turn on TV

Step 2) Select Network Connection option in Network Menu.

Step 3) Select Start Connection button in Network Connection.

Step 4) If the system finds any AP like blow PIC, it is working well.

4.7. LNB voltage and 22KHz tone check

(only for DVB-S/S2 model)

▪ Test method

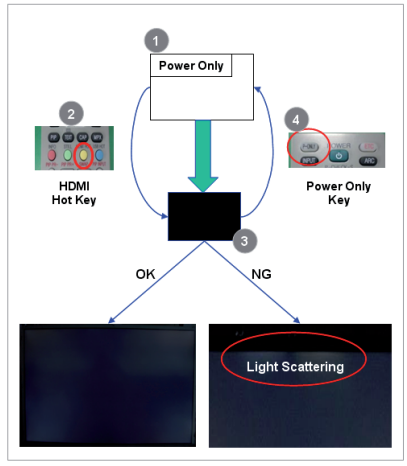
(1) Set TV in Adj. mode using POWER ON.
(2) Connect cable between satellite ANT and test JIG.
(3) Press Yellow key(ETC+SWAP) in Adj Remote control to make LNB on.
(4) Check LED light 'ON' at 18 V menu.
(5) Check LED light 'ON' at 22 KHz tone menu.
(6) Press Blue key(ETC+PIP INPUT) in Adjustment Remote control to make LNB off.
(7) Check LED light 'OFF' at 18 V menu.
(8) Check LED light 'OFF' at 22 KHz tone menu.

▪ Test result

(1) After press LNB On key, '18 V LED' and '22 KHz tone LED' should be ON.
(2) After press LNB OFF key, '18 V LED' and '22 KHz tone LED' should be OFF.

4.8. Inspection of light scattering

▪ Test Method



(1) Push "Power only" key.
(2) Push "HDMI" hot key.
(3) Inspect whether light scattering is occurred in internal black pattern or not.
(4) Push "Power only" key.

4.9. Option selection per country

4.9.1. Overview

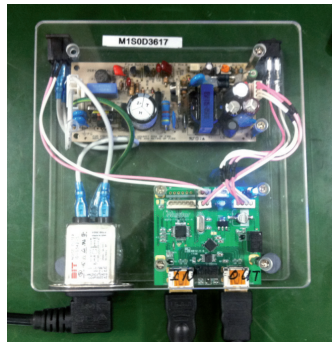
- Option selection is only done for models in Non-EU.

4.9.2. Method

(1) Press ADJ key on the Adjustment Remote Control, then select Country Group Meun
(2) Depending on destination, select Country Group Code 04 or Country Group EU then on the lower Country option, select US, CA, MX. Selection is done using +, - or ►◄ key.

4.10. MHL Test

(1) Turn on TV
(2) Select HDMI4 mode using input Menu.
(3) Set MHL Zig(M1S0D3617) using MHL input, output and power cord.
(4) Connect HDMI cable between MHL Zig and HDMI4 port.
(5) Check LED light of Zig and Module of Set.



Result) If, the LED light is green and the Module shows normal stream → OK, Else → NG

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4.11. HDMI ARC Function Inspection

(1) Test equipment
- Optic Receiver Speaker
- MSHG-600 (SW: 1220 ↑)
- HDMI Cable (for 1.4 version)

(2) Test method

1) Insert the HDMI Cable to the HDMI ARC port from the master equipment (HDMI1)

2) Check the sound from the TV Set

3) Check the Sound from the Speaker or using AV & Optic TEST program (It's connected to MSHG-600)

Flow Line

Cell Line

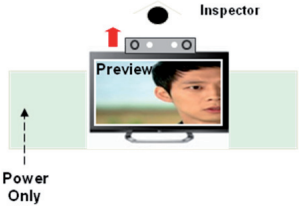
* Remark: Inspect in Power Only Mode and check SW version in a master equipment

4.12. Camera Function Inspection

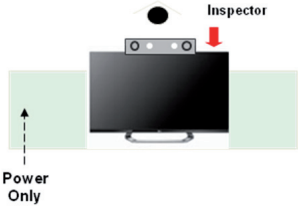
(1) Objective : To check how it connects between Camera and PCBA normally, and their Function

(2) Test Method : This Inspection is available only Power-Only Status.

1) Slide Camera Up.
2) Camera's Preview picture apeears on TV Set.
3) Slide Camera Down.



<Slide Up Status>



<Slide Down Status>

4.13. Ship-out mode check(In-stop)

▪ After final inspection, press "IN-STOP" key of the Adjustment remote control and check that the unit goes to Stand-by mode.

4.14. Tool Option selection

- Method: Press ADJ key on the Adj. R/C, then select Tool option.

4.15. GND and Internal Pressure check

4.15.1. Method

(1) GND & Internal Pressure auto-check preparation
- Check that Power cord is fully inserted to the SET. (If loose, re-insert)

(2) Perform GND & Internal Pressure auto-check
- Unit fully inserted Power cord, Antenna cable and A/V arrive to the auto-check process.
- Connect D-terminal to AV JACK TESTER
- Auto CONTROLLER(GWS103-4) ON
- Perform GND TEST
- If NG, Buzzer will sound to inform the operator.
- If OK, changeover to I/P check automatically. (Remove CORD, A/V form AV JACK BOX.)
- Perform I/P test
- If NG, Buzzer will sound to inform the operator.
- If OK, Good lamp will lit up and the stopper will allow the pallet to move on to next process.

4.15.2. Checkpoint

▪ TEST voltage
- GND: 1.5 KV / min at 100 mA
- SIGNAL: 3 KV / min at 100 mA

▪ TEST time: 1 second

▪ TEST POINT
- GND TEST = POWER CORD GND & SIGNAL CABLE METAL GND
- Internal Pressure TEST = POWER CORD GND & LIVE & NEUTRAL

▪ LEAKAGE CURRENT: At 0.5 mArms

5. Audio

No.	Item	Min	Typ	Max	Unit	Remark
1.	Audio practical max Output, L/R (Distortion=10% max Output)	9.0	10.0	12.0	W	Measurement condition Auto Volume :Off Audio EQ : Off Clear Voice : Off Virtual Surround:Off
		8.5	8.9	9.8	Vrms	
2.	Speaker (8 Ω Impedance)		10.0	15.0	W	

Measurement condition:
(1) RF input: Mono, 1 KHz sine wave signal, 100 % Modulation
(2) CVBS, Component: 1 KHz sine wave signal 0.5 Vrms
(3) RGB PC: 1 KHz sine wave signal 0.7 Vrms

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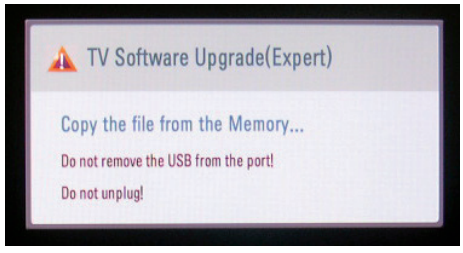
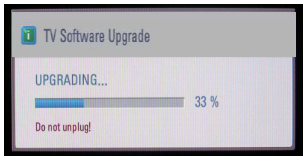
6. USB S/W Download(Service only)

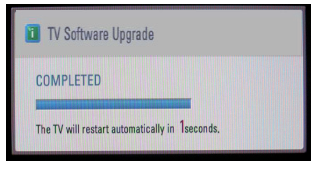
(1) Put the USB Stick to the USB socket.
(2) Automatically detecting update file in USB Stick.
- If your downloaded program version in USB Stick is Low, it didn't work. But your downloaded version is High, USB data is automatically detecting.(Download Version High & Power only mode, Set is automatically Download)

(3) Show the message "Copying files from memory".



(4) Updating is starting.





(5) Updating Completed, The TV will restart automatically.
(6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)

* If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ ATV test on production line.

* After downloading, have to adjust Tool Option again.

(1) Push "IN-START" key in service remote control.
(2) Select "Tool Option 1" and push "OK" key.
(3) Punch in the number. (Each model has their number)

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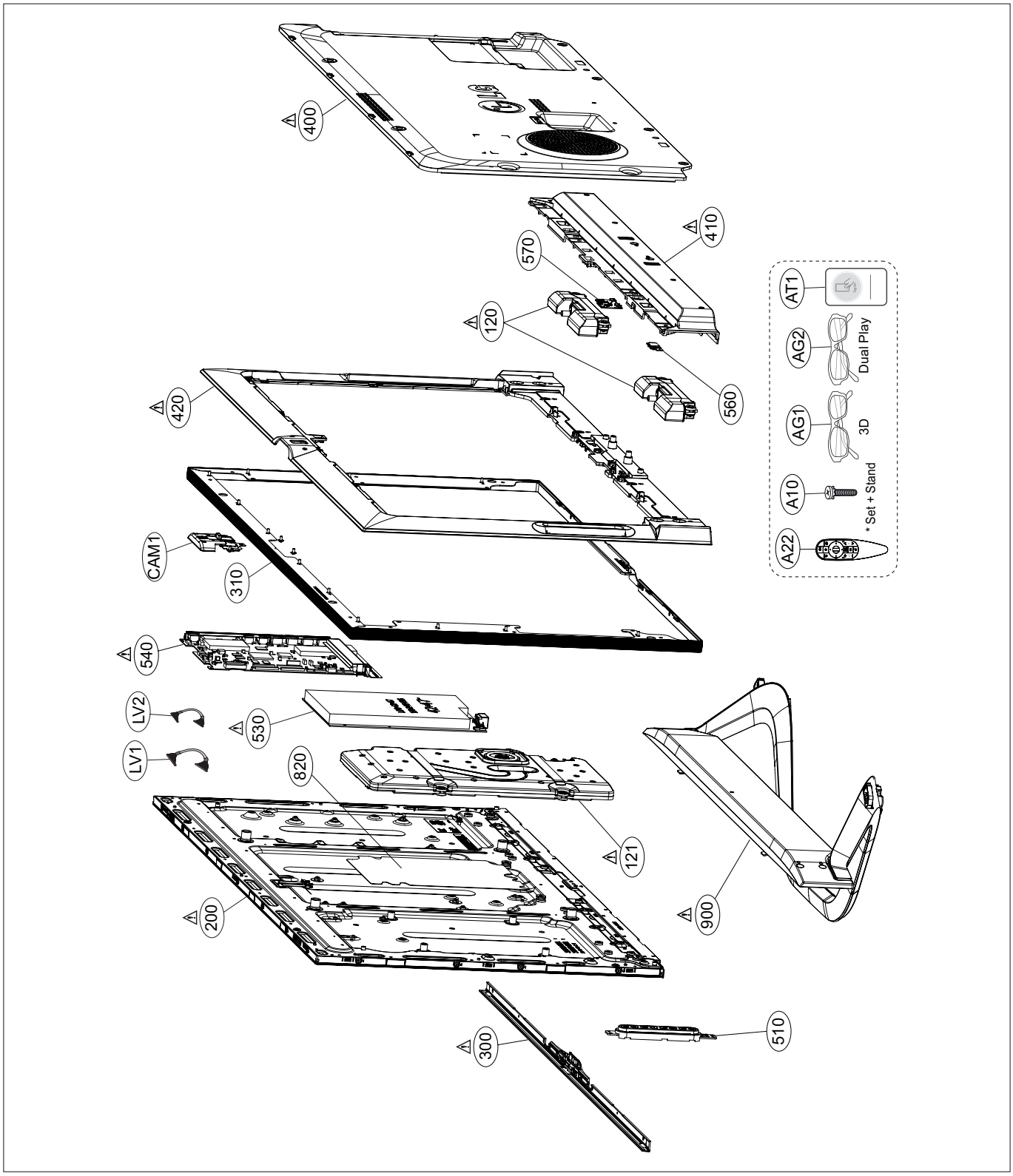
EXPLODED VIEW

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and EXPLODED VIEW.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.



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System Configuration

Clock for LG1154D

MAIN Clock(24Mhz)

C100 10pF — X_TAL_1 — Y101 24MHz X100 — R100 1M — XIN_MAIN

C101 10pF — X_TAL_2 — GND_2 — XO_MAIN

System Clock for Analog block(24Mhz)

NVRAM

EEPROM_RENESAS IC102 R1EX24256BASA0A

+3.3V_NORMAL — C103 0.1uF

Write Protection
- Low : Normal Operation
- High : Write Protection

A0 A1 A2 VSS — A0'h — VCC WP SCL SDA

R139 33 I2C_SCL5

R140 33 I2C_SDA5

EEPROM_ST IC102 M24256-BWMN6TP

PLL SET[1:0] : internal pull up
"00" : CPU(1200Mhz),M0 / M1 DDR(792,792 Mhz)
"01" : CPU(1056Mhz),M0 / M1 DDR(672,672 Mhz)
"10" : CPU(1056Mhz),M0 / M1 DDR(792,792 Mhz)
"11" : CPU(960Mhz),M0 / M1 DDR(792,792 Mhz)

OPT R100 33 PLLSET1

R101 33 OPT PLLSET0

OP MODE[1:0]
"00" : Normal Mode
"01/10/11" : Internal Test mode

+3.3V_NORMAL — OPT R133 33 OPM1 — R134 33 OPT OPM0

+3.3V_NORMAL — R150 3.3K OPT — INSTANT boot MODE "1 : Instant boot" "0 : normal" (internal pull down) — INSTANT_BOOT

INSTANT_MODE0

+3.3V_NORMAL — R117 3.3K OPT — BOOT MODE "0 : EMMC" "1 : TEST MODE" — BOOT_MODE — R118 3.3K

BOOT_MODE0

Jtag I/F For Main

TP101 TRST_N0
TP102 TDI0
TP103 TDO0
TP104 TMS0
TP105 TCK0
TP106 SOC_RESET

C106 33pF 50V

+3.3V_NORMAL — TP108 — TP109

IC100 LG1154D_H13D

EB_ADDR[0-14] EB_DATA[0-7] EMMC_DATA[0-7]

USB_OCD2 USB_CTL2 /USB_OCD3 USB_CTL3 EB_BE_N1 EB_OE_N EB_BE_N0

EB_ADDR[14] EB_ADDR[13] EB_ADDR[12] EB_ADDR[11] EB_ADDR[10] EB_ADDR[9] EB_ADDR[8] EB_ADDR[7] EB_ADDR[6] EB_ADDR[5] EB_ADDR[4] EB_ADDR[3] EB_ADDR[2] EB_ADDR[1] EB_ADDR[0]

EB_DATA[7] EB_DATA[6] EB_DATA[5] EB_DATA[4] EB_DATA[3] EB_DATA[2] EB_DATA[1] EB_DATA[0]

EMMC_CLK EMMC_CMD EMMC_RST EMMC_DATA[7] EMMC_DATA[6] EMMC_DATA[5] EMMC_DATA[4] EMMC_DATA[3] EMMC_DATA[2] EMMC_DATA[1] EMMC_DATA[0]

EPHY_REFCLK EPHY_CRS_DV EPHY_MDIO EPHY_MDC EPHY_EN EPHY_TXD1 EPHY_TXD0 EPHY_RXD1 EPHY_RXD0

K35 K36 K37 L35 H35 H36 J35 J36 H37 G37 G36 G35 F36 E35 E36 E37 E35 D37 D36 D35 C36 C35 B37 B36 B35 C32 B33 A33 C33 A34 B34 C34 A36 Y37 Y36 W35 T36 W36 V35 V37 V36 U35 U36 U37 AU11 AU8 AT8 AR8 AR10 AT10 AU10 AT11 AR11

EB_CS3/GPIO03 EB_CS2/GPIO02 EB_CS1/GPIO01 EB_CS0/GPIO00 EB_WE_N/GPIO05 EB_RE_N/GPIO04 EB_WAIT/GPIO06 EB_OE_N/GPIO82 EB_BE_N0/GPIO80 EB_ADDR15/GPIO89 EB_ADDR14/GPIO88 EB_ADDR13/GPIO103 EB_ADDR12/GPIO102 EB_ADDR11/GPIO101 EB_ADDR10/GPIO100 EB_ADDR9/GPIO99 EB_ADDR8/GPIO98 EB_ADDR7/GPIO97 EB_ADDR6/GPIO96 EB_ADDR5/GPIO111 EB_ADDR4/GPIO110 EB_ADDR3/GPIO109 EB_ADDR2/GPIO108 EB_ADDR1/GPIO107 EB_ADDR0/GPIO106 EB_DATA7/GPIO105 EB_DATA6/GPIO104 EB_DATA5/GPIO119 EB_DATA4/GPIO118 EB_DATA3/GPIO117 EB_DATA2/GPIO116 EB_DATA1/GPIO115 EB_DATA0/GPIO114 EMMC_CLK EMMC_CMD EMMC_RESETN EMMC_DATA7 EMMC_DATA6 EMMC_DATA5 EMMC_DATA4 EMMC_DATA3 EMMC_DATA2 EMMC_DATA1 EMMC_DATA0 RMII_REF_CLK RMII_CRS_DV RMII_MDIO RMII_MDC RMII_TXEN RMII_TXD1 RMII_TXD0 RMII_RXD1 RMII_RXD0

XIN_MAIN — R152 560 — XO_MAIN

A26 XIN
B26 XOUT
B27 XTAL_BYPASS
AT37 H13DA_XTAL

SOC_RESET — AU16 PORES_N

OPM1 AD34 OPM1
OPM0 AD33 OPM0

H13A_SCL AT26 H13DA_SCL
H13A_SDA AU26 H13DA_SDA

TRST_N0 AP9 TRST_N0
TMS0 AN9 TMS0
TCK0 AP11 TCK0
TDI0 AN11 TDI0
TDO0 AN10 TDO0
AM10 TRST_N1
AM9 TMS1
AM11 TCK1
AM12 TDI1
AL11 TDO1

PLLSET1 AL9 PLLSET1
PLLSET0 AL10 PLLSET0
BOOT_MODE AE34 BOOT_MODE

EPHY_INT — R149 33 — Y33 EXT_INTR3/GPIO70
W32 EXT_INTR2/GPIO69
R151 33 W33 EXT_INTR1/GPIO68
R174 33 W34 EXT_INTR0/GPIO67

R184 33 1/16W 5%

SOC_RX AU12 UART0_RXD
SOC_TX AT12 UART0_TXD
M_REMOTE_RX AU13 UART1_RXD
M_REMOTE_TX AT13 UART1_TXD
M_REMOTE_RTS AP12 UART1_RTS
M_REMOTE_CTS AR12 UART1_CTS

TP106 IRB_SPI_SS — IRB_SPI_SS AE35 SPI_CS0/GPIO36
TP107 IRB_SPI_MOSI — IRB_SPI_MOSI AE36 SPI_DO0/GPIO38
TP110 IRB_SPI_MISO — IRB_SPI_MISO AF36 SPI_DI0/GPIO39
TP112 IRB_SPI_CK — IRB_SPI_CK AF35 SPI_SCLK0/GPIO37
AG34 SPI_CS1
AF33 SPI_DO1
AG33 SPI_DI1
AG32 SPI_SCLK1

I2C_SCL1 AR15 SCL0/GPIO66
I2C_SDA1 AP15 SDA0/GPIO65
I2C_SCL_MICOM_SOC AR16 SCL1/GPIO64
I2C_SDA_MICOM_SOC AP16 SDA1/GPIO79
I2C_SCL2_SOC AP17 SCL2/GPIO78
I2C_SDA2_SOC AR17 SDA2/GPIO77
I2C_SCL4 AP8 SCL3
I2C_SDA4 AR6 SDA3
I2C_SCL5 AH32 SCL4
I2C_SDA5 AJ33 SDA4
I2C_SCL6 AH34 SCL5
I2C_SDA6 AH33 SDA5

CAM_CE1_N F33
CAM_CE2_N F34
CAM_CD1_N D32
CAM_CD2_N E32
CAM_VS1_N/GPIO85 G32
CAM_VS2_N/GPIO86 F32
CAM_IREQ_N/GPIO73 G34
CAM_RESET D33
CAM_INPACK_N/GPIO74 H32
CAM_VCCEN_N/GPIO87 E33
CAM_WAIT_N/GPIO84 D34
CAM_REG_N/GPIO72 H33
CAM_IOIS16_N/GPIO83

SC_CLK/GPIO130 T33
SC_DATA/GPIO133 U33
SC_VCCEN/GPIO129 T32
SC_VCC_SEL/GPIO128 V32
SC_RST/GPIO131 V33
SC_DATA/GPIO132 V34

SD_CLK/GPIO125 A25
SD_CMD/GPIO124 C25
SD_CD_N/GPIO123 B25
SD_WP_N/GPIO122 D25
SD_DATA3/GPIO121 E24
SD_DATA2/GPIO120 D24
SD_DATA1/GPIO135 C24
SD_DATA0/GPIO134 C24

EB_DATA7/GPIO105 C32
EB_DATA6/GPIO104 B33
EB_DATA5/GPIO119 A33
EB_DATA4/GPIO118 C33
EB_DATA3/GPIO117 A34
EB_DATA2/GPIO116 B34
EB_DATA1/GPIO115 C34
EB_DATA0/GPIO114 A36

USB2_2_DP0 L37
USB2_2_DM0 L36
USB2_2_TXRTUNE K34

USB2_1_DP0 M37
USB2_1_DM0 M36
USB2_1_TXRTUNE K33

USB2_0_DP AU7
USB2_0_DM AT7
USB2_0_TXRTUNE AP7

USB3_DP0 P37
USB3_DM0 P36
USB3_RXBP N37
USB3_RXBM N36
USB3_TXBP R36
USB3_TXBM R37
USB3_RBIAS N34
USB3_REFCLKP P33
USB3_REFPADCLKM P32
USB3_REFPADCLKP

NC_1 L32
NC_2 L33
NC_3 M31
NC_4 A31

J32 GPIO136
J33 GPIO137
K32 GPIO138
J34 GPIO139

GPIO31 AL34 CAM_SLIDE_DET
GPIO30 AM33
GPIO29 AM32
GPIO28 AF30
GPIO27 AN34 /RST_PHY
GPIO26 AK34 RF_SWITCH_CTL
GPIO25 AL33
GPIO24 AL32
GPIO23/UART2_TX AR9 UART2_TX
GPIO22/UART2_RX AM5 UART2_RX
GPIO21 AM6 AMP_RESET_N
GPIO20 AM7
GPIO19 AL6 INSTANT_BOOT
GPIO18 AK7
GPIO17 AK6 SC_DET
GPIO16 AK5 AV1_CVBS_DET
GPIO15 AJ5
GPIO14 AJ6 COMP1_DET
GPIO13 AJ7 M_RFModule_RESET
GPIO12 AH6 HP_DET
GPIO11 AG7 FRC_RESET
GPIO10 AG6 /TU_RESET1
GPIO9 AG5 /S2_RESET
GPIO8 AF5 VCOM_DYN
GPIO7 AH30 PMIC_RESET
GPIO6 AG30 /RST_HUB
GPIO5 AN33 FE_LNA_Ctrl2
GPIO4 AK33 /TU_RESET2
GPIO3 AE30 HDMI_S/W_RESET
GPIO2 AD30
GPIO1 AN32 FE_LNA_Ctrl1
GPIO0 AK32 HDMI_INT

DDCD0_CK AC32 R169 3.3K +3.3V_NORMAL
DDCD0_DA AC33 R170 3.3K
HPD0 AB33

PHY0_ARC_OUT_0 AE37 SPDIF_OUT_ARC
PHY0_RX0N_0 AC36 HDMI_RX0-
PHY0_RX0P_0 AC37 HDMI_RX0+
PHY0_RX1N_0 AB36 HDMI_RX1-
PHY0_RX1P_0 AB37 HDMI_RX1+
PHY0_RX2N_0 AA36 HDMI_RX2-
PHY0_RX2P_0 AA37 HDMI_RX2+
PHY0_RXCN_0 AD36 HDMI_CLK-
PHY0_RXCP_0 AD37 HDMI_CLK+

HUB_PORT_OVER0 R32 /USB_OCD1
HUB_VBUS_CTRL0 R33 USB_CTL1

+3.3V_NORMAL — For ISP — R103 3.3K — SW100 JTP-1127WEM — DEBUG

INSTANT_BOOT — local dimming I2C port — DEBUG

SC_DET — AV1_CVBS_DET

Model Option

+3.3V_NORMAL

R115 10K TAIWAN — R116 10K INTERNAL FRC — R114 10K FHD — R116 10K OLED — R119 10K VIU MODULE — R122 10K OPT — R124 10K CP BOX — R126 10K DVB_T2_TUNER — R128 10K DVB_S_TUNER — R130 10K AJ_JA — R132 10K EPI

HW_OPT_0 AREA option1
HW_OPT_1 FRC option
HW_OPT_2 Pannel Resol
HW_OPT_3 OLED option
HW_OPT_4 EPI PANEL version
HW_OPT_5 reserved
HW_OPT_6 CP BOX
HW_OPT_7 T2 support
HW_OPT_8 satellite support
HW_OPT_9 AREA option2
HW_OPT_10 EPI selection

NON_TAIWAN R100 10K — R117 NO_FRC 10K — R113 HD 10K — NON_OLED R118 10K — VIU_MODULE R120 10K — R121 10K — NON_CP_BOX R125 10K — NON_DVB_T2_TUNER R127 10K — NON_DVB_S_TUNER R129 10K — NON_AJ_JA R131 10K — NON_EPI R133 10K

		HIGH	LOW
MODEL_OPT_0	Area1	Taiwan	non Taiwan
MODEL_OPT_1	FRC	FRC(120Hz)	No FRC(60Hz)
MODEL_OPT_2	Panel	FHD	UD
MODEL_OPT_3	OLED	OLED	NON OLED
MODEL_OPT_4	Module	V13	V12
MODEL_OPT_5	Reserved		Default
MODEL_OPT_6	CP BOX	Enable	Disable
MODEL_OPT_7	T2 Tuner	Support	Not Support
MODEL_OPT_8	S Tuner	Support	Not Support
MODEL_OPT_9	Area2	AJ_JA	non AJ_JA
MODEL_OPT_10	EPI	Support	Not Support

I2C PULL UP

+3.3V_TU +3.3V_TU — +3.3V_NORMAL +3.3V_NORMAL

KR_PIP_NOT R135-*1 3.3K — R137 3.3K — R138 3.3K — R141 3.3K — R142 3.3K — R143 3.3K — R144 3.3K — R145 3.3K — R146 3.3K — R147 3.3K — R148 3.3K

I2C_SDA1 I2C_SCL1 I2C_SDA_MICOM_SOC I2C_SCL_MICOM_SOC I2C_SDA2_SOC I2C_SCL2_SOC I2C_SDA4 I2C_SCL4 I2C for tuner I2C_SDA5 I2C_SCL5 I2C_SDA6 I2C_SCL6 I2C for tuner

KR_PIP R135-*1 1.5K — KR_PIP R135-*1 1.5K

I2C_SDA_MICOM 33 R105 33 I2C_SDA_MICOM_SOC
I2C_SCL_MICOM 33 R106 33 I2C_SCL_MICOM_SOC

I2C_SDA2 33 R102 33 I2C_SDA2_SOC
I2C_SCL2 33 R104 33 I2C_SCL2_SOC

+3.3V_NORMAL — CI R153 10K — R154 10K — R155 10K — CI

/PCM_CE4 /PCM_CE3 CAM_CD1_N CAM_CD2_N CAM_IREQ_N PCM_RESET CAM_INPACK_N PCM_5V_CTL CAM_WAIT_N CAM_REG_N

SMARTCARD_CLK/SD_EMMC_DATA[0] SMARTCARD_DET/SD_EMMC_DATA[3] SMARTCARD_VCC/SD_EMMC_CMD SMARTCARD_PWR_SEL/SD_EMMC_DATA[1] SMARTCARD_RST/SD_EMMC_DATA[2] SMARTCARD_DATA/SD_EMMC_CLK

Only SMART CARD interface

USB2_HUB_IC_IN_DP R161 33 1% — USB2_HUB_IC_IN_DM R162 33 1%

USB_DP2 R160 200 1% — USB_DM2 R159 200 1%

WIFI_DP R163 200 1% — WIFI_DM R164 200 1%

C104 0.1uF — C105 0.1uF — R135 200 1%

AC-coupling CAP Place near by LG1154D

IR_B_RESET — TP112 — IR_B_RESET

Debug

+3.3V_NORMAL — R165 3.3K — UART2_RX — UART2_TX — P101 12507WS-04L DEBUG

THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
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LG ELECTRONICS

BSD-NC4_H001-HD

MODEL		DATE	2012-11-14
BLOCK	H13 D CHIP	SHEET	/

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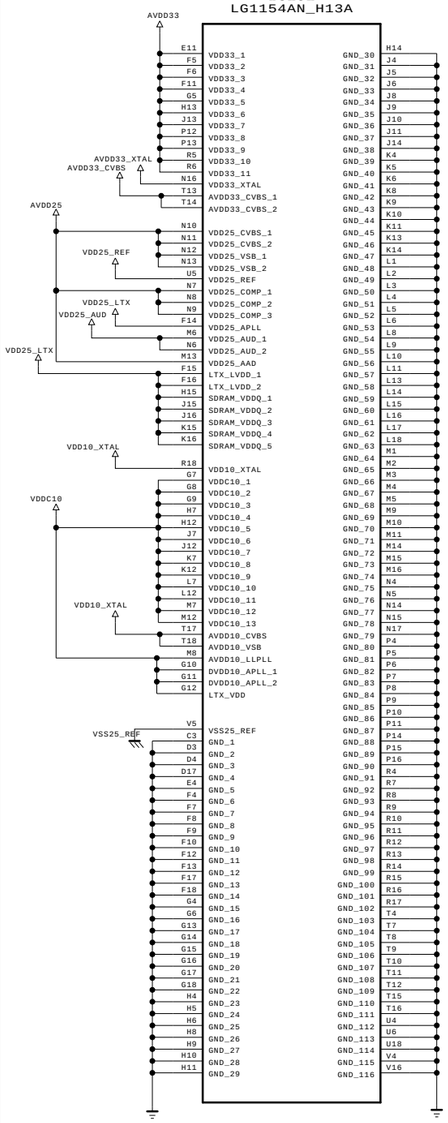
LG1154A LG1154D

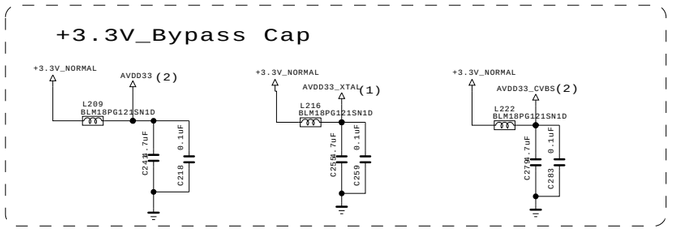
LG1154A

H13A_NON_BRAZIL

IC101
LG1154AN_H13A

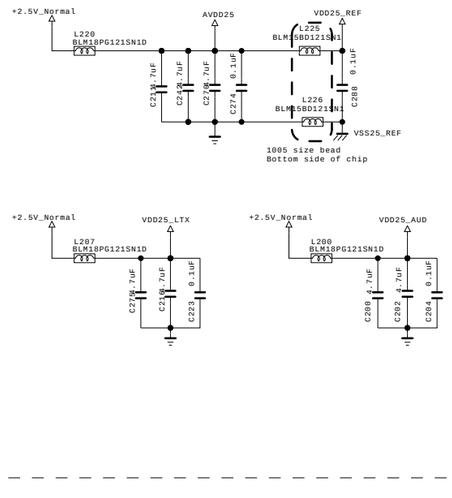


+3.3V_Bypass Cap

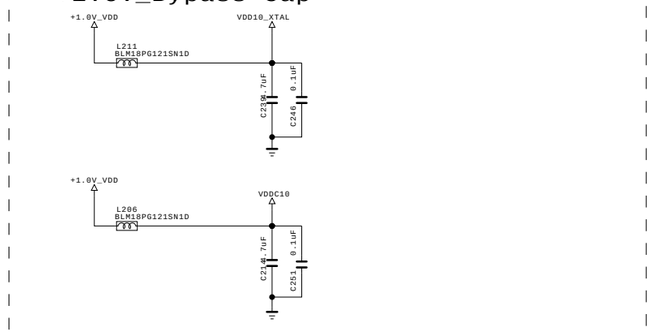


+2.5V_Bypass Cap

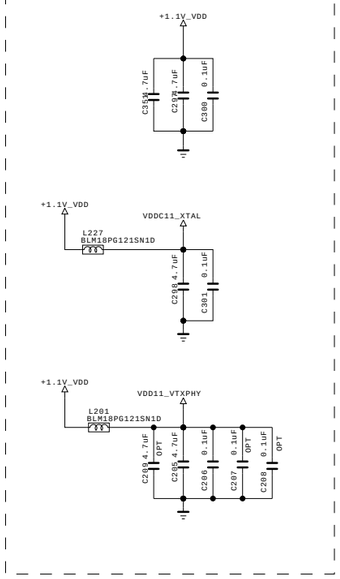
AFE 3CH Power



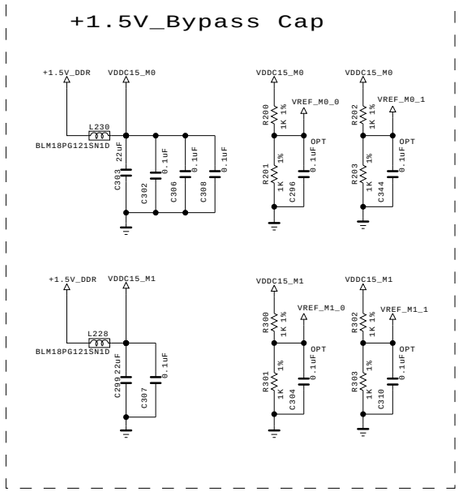
+1.0V_Bypass Cap



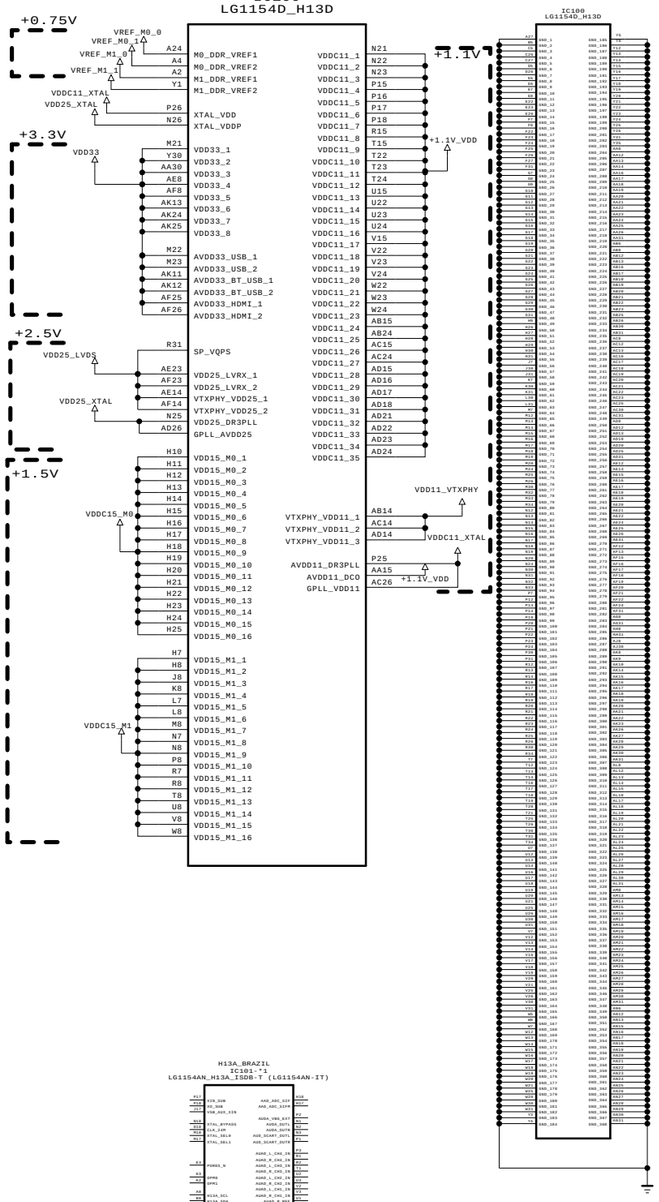
+1.1V_Bypass Cap



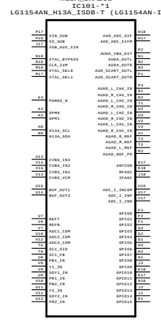
+1.5V_Bypass Cap



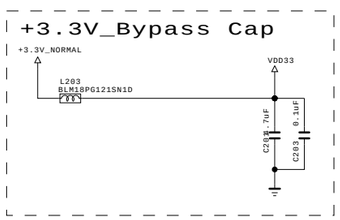
IC100
LG1154D_H13D



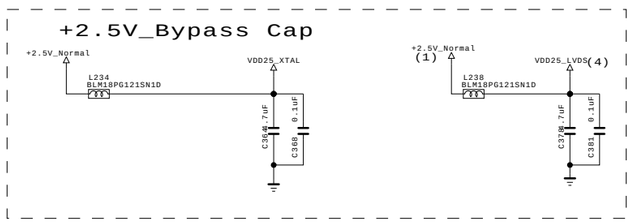
H13A_BRAZIL
IC101-*1
LG1154AN_H13A_ISDB-T (LG1154AN-IT)



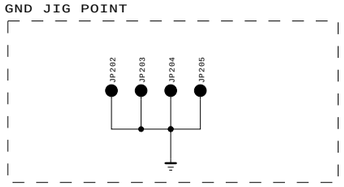
+3.3V_Bypass Cap



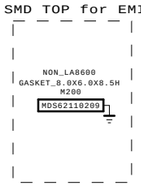
+2.5V_Bypass Cap



GND JIG POINT



SMD TOP for EMI



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11/05/31

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BSD-NC4_H002-HD

MODEL		DATE	2012-12-24
BLOCK	MAIN POWER	SHEET	/

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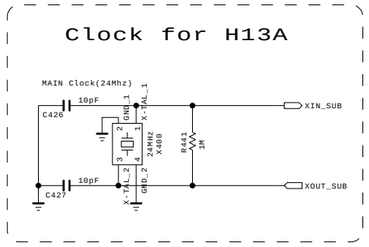
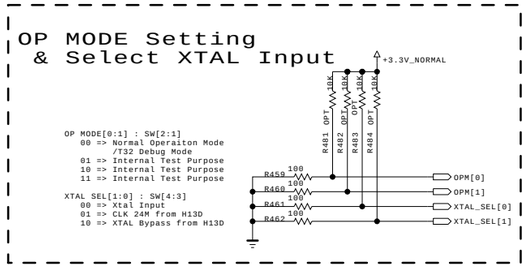
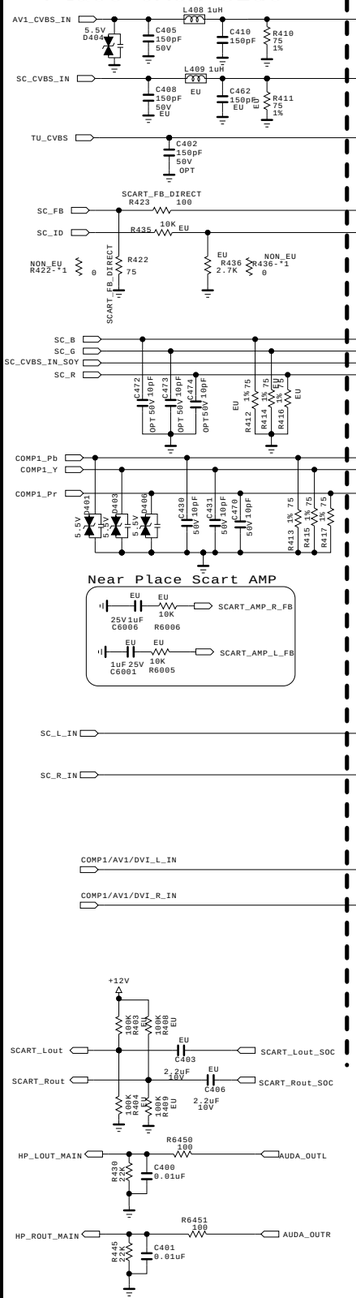
Clock for H13A



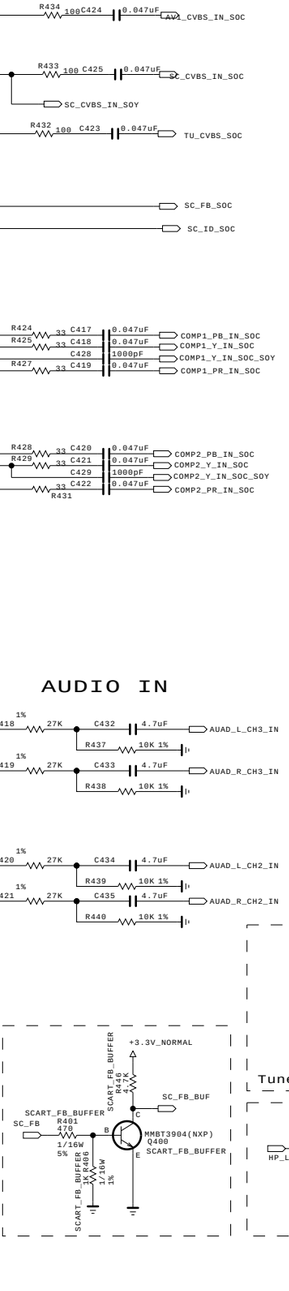
OP MODE Setting & Select XTAL Input



Place JACK Side

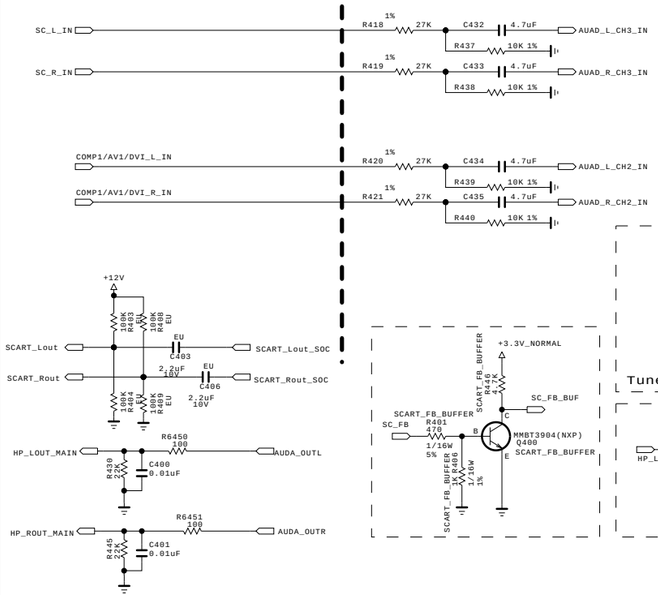


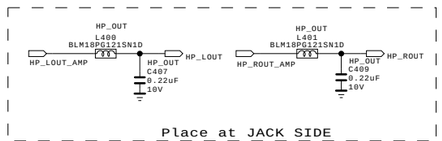
Place SOC Side

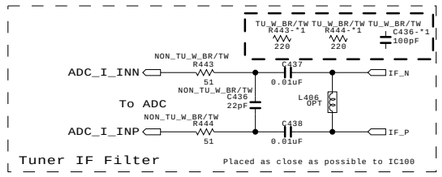


Near Place Scart AMP

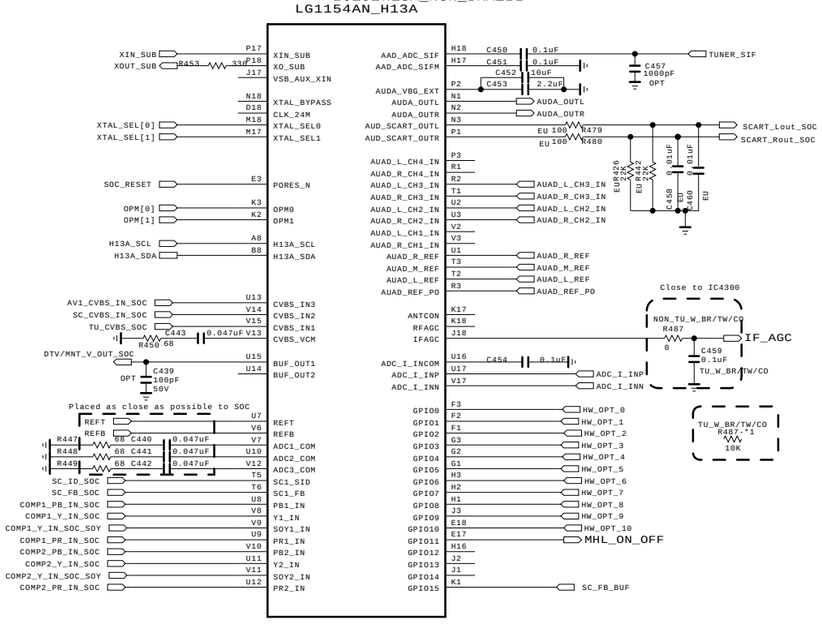
AUDIO IN



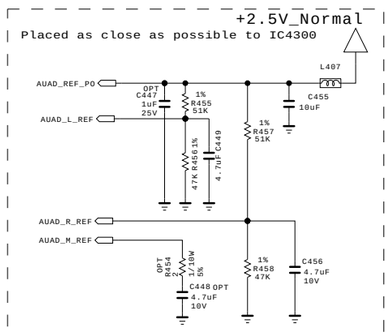




IC101H13A_NON_BRAZIL LG1154AN_H13A



+2.5V_Normal



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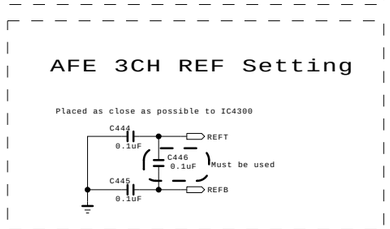

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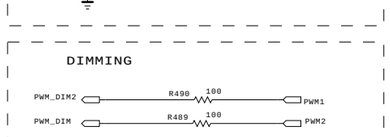
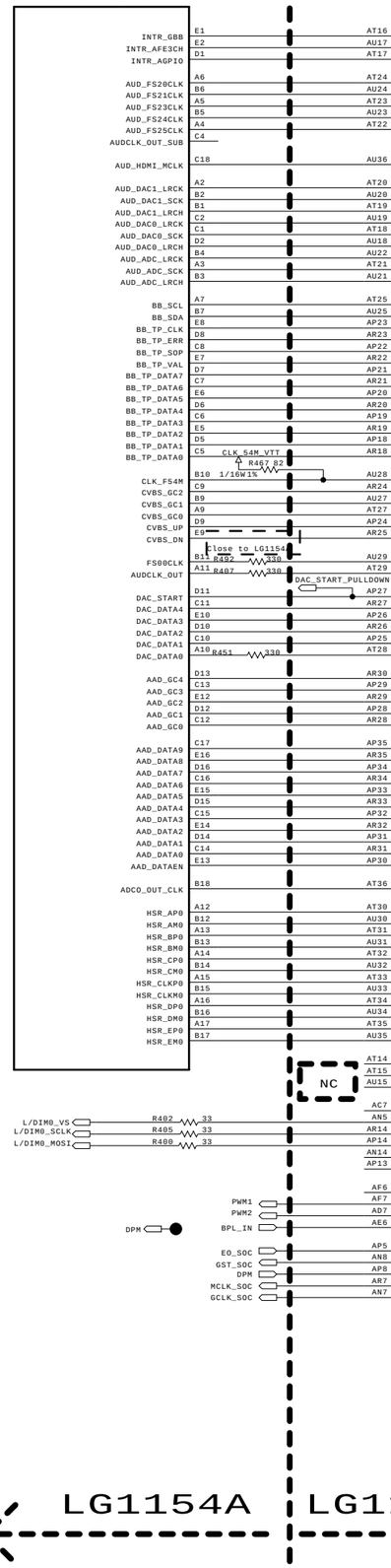
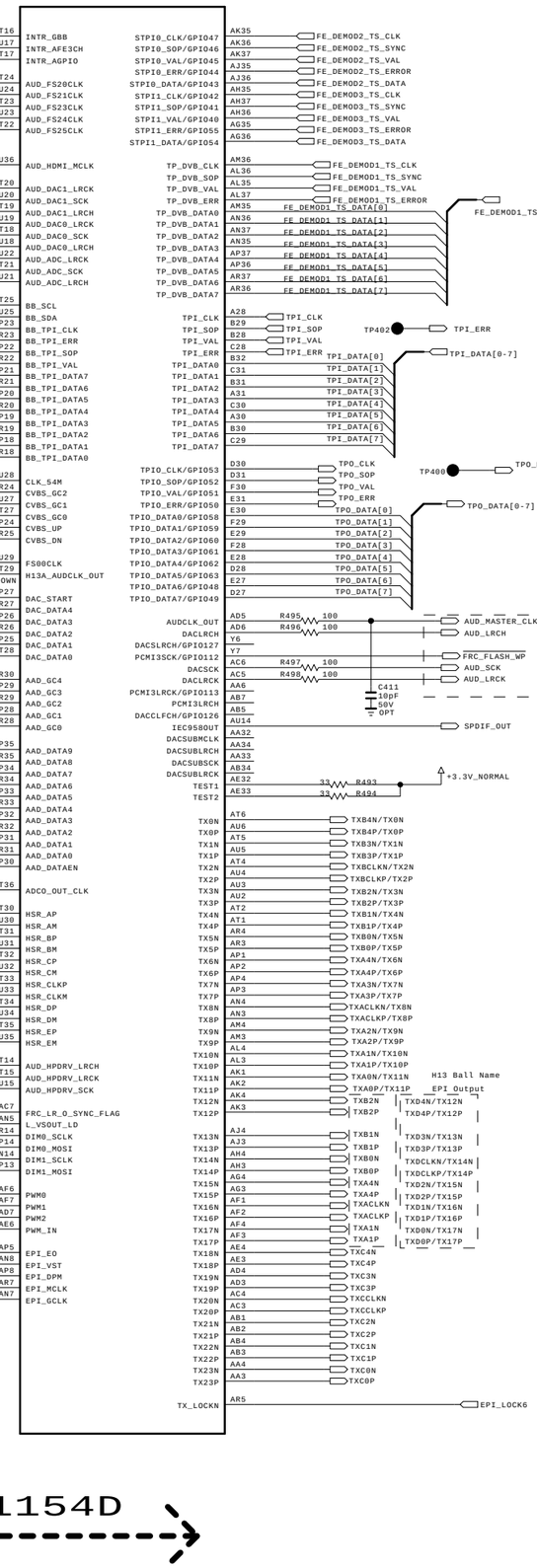


IC101 LG1154AN_H13A

H13A_NON_BRAZIL



IC100 LG1154D_H13D



LG1154A LG1154D

THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
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LG ELECTRONICS

BSD-NC4_H004-HD

MODEL		DATE	2012-11-13
BLOCK	MAIN AUDIO/VIDEO	SHEET	/

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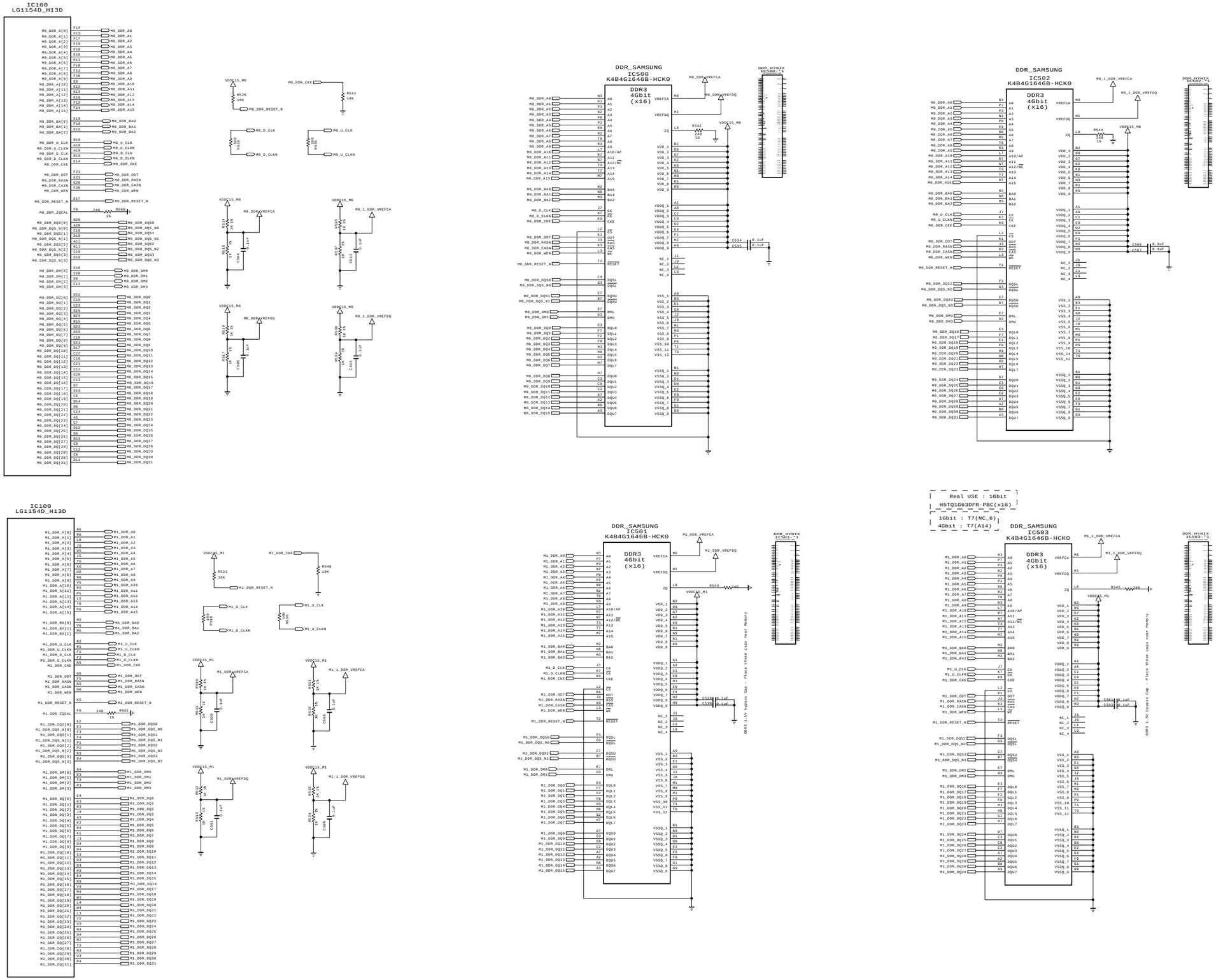

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LG ELECTRONICS

BSD-NC4_H005-HD

MODEL		DATE	2012-09-14
BLOCK	MAIN DDR	SHEET	/

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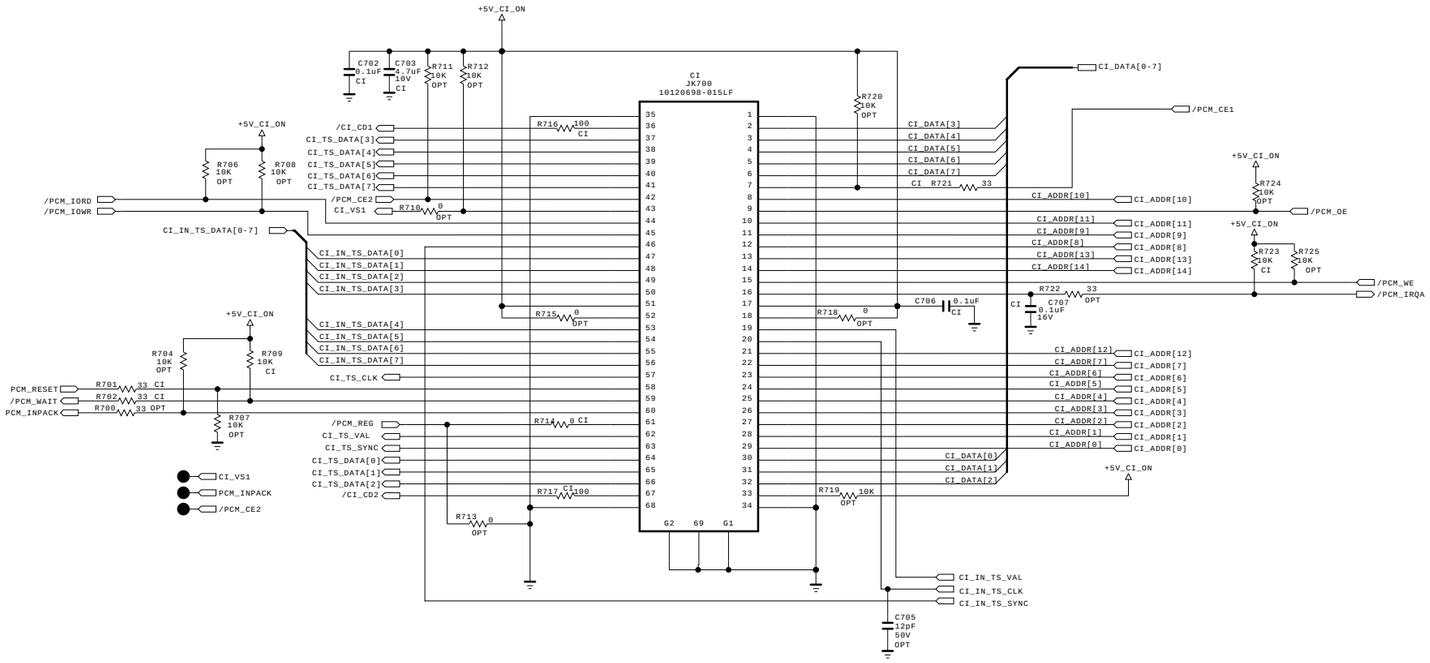

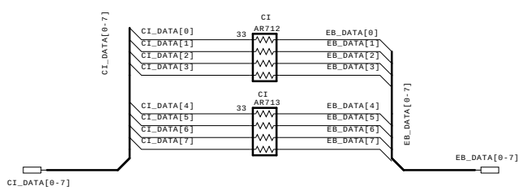

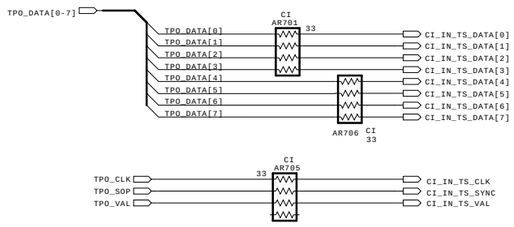

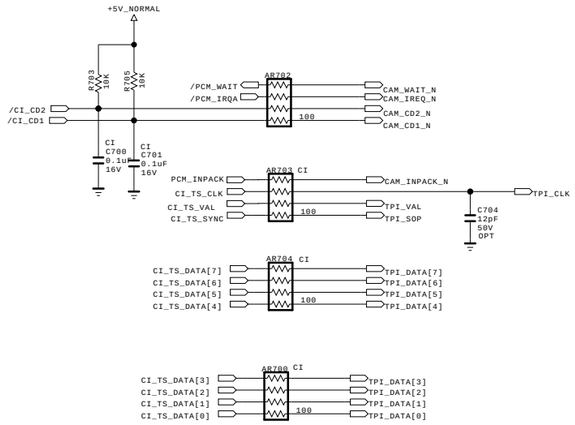

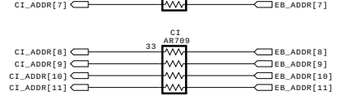

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LG ELECTRONICS

BSD-NC4_H007-HD

MODEL		DATE	2012-10-20
BLOCK	PCMCIA	SHEET	/

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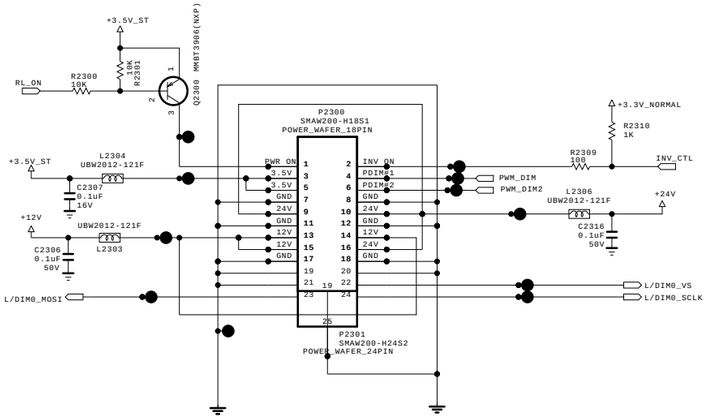

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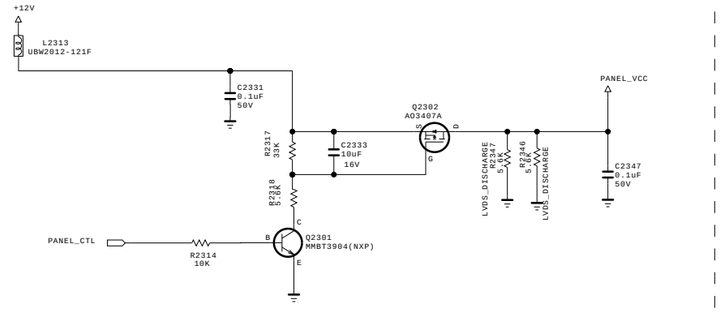

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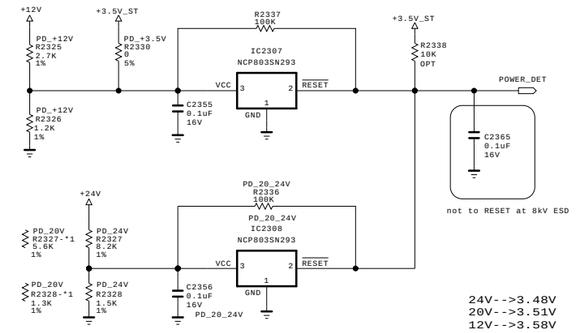
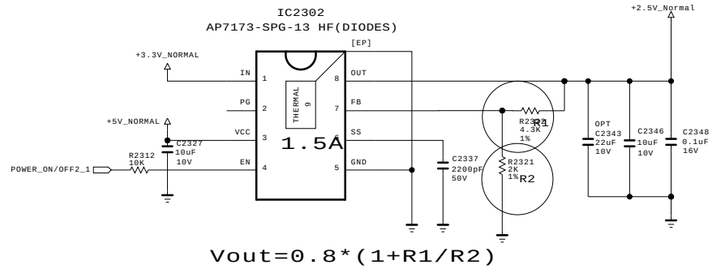
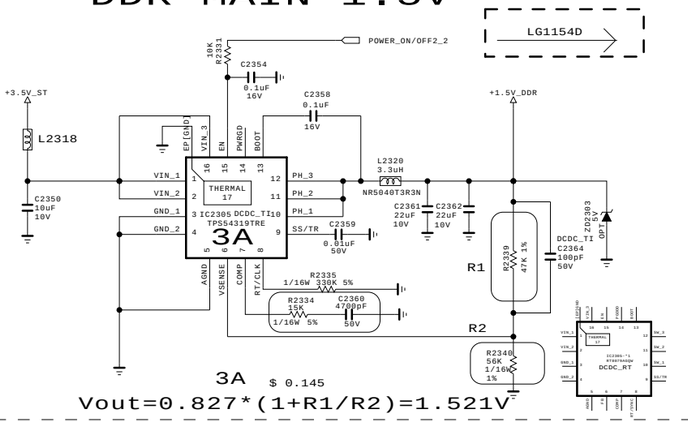


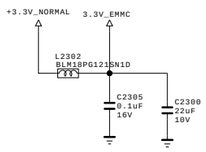
+2.5V



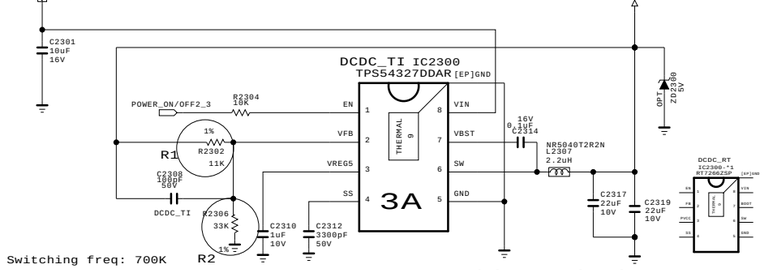
DDR MAIN 1.5V



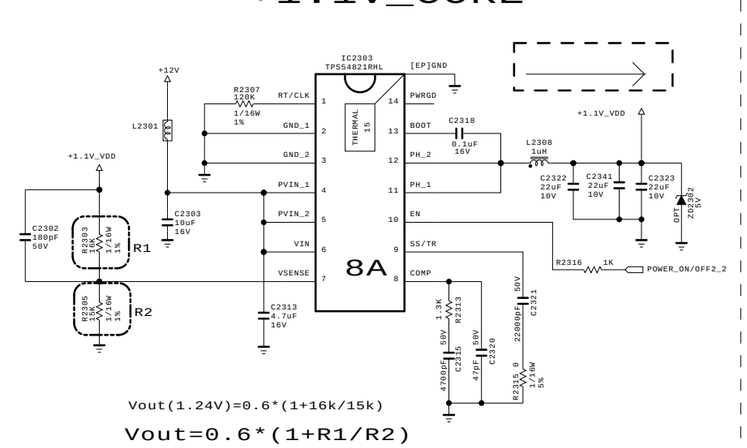
eMMC POWER



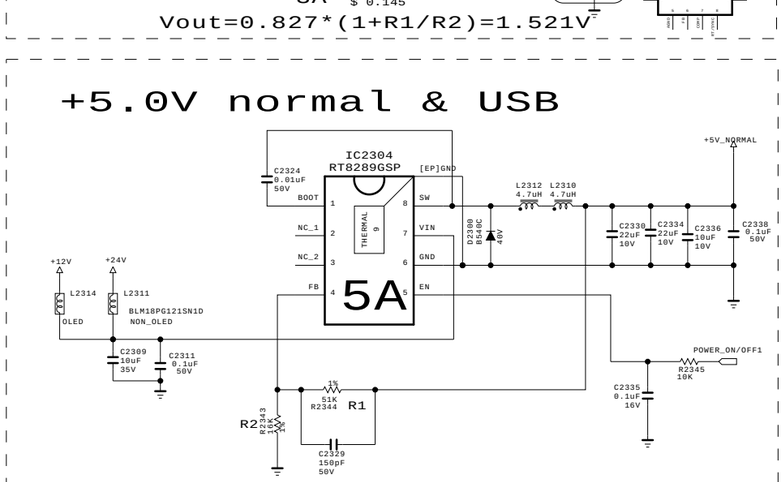
+1.0V_VDD



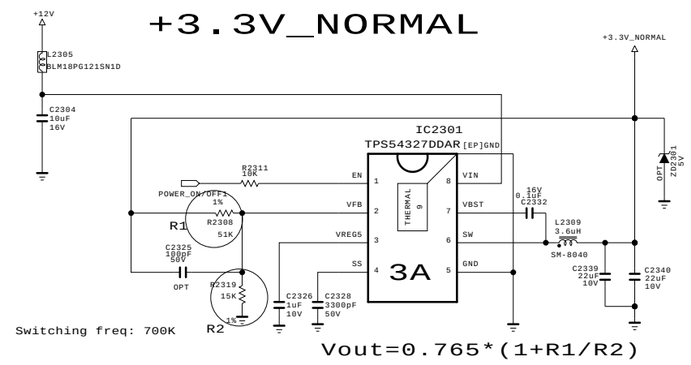
+1.1V_CORE



+5.0V normal & USB



+3.3V_NORMAL



POWER UP SEQUENCE

5V/3.3V->2.5V->1.5V/1.1V->1.0V

LG1154D : 3.3V->2.5V->1.5V->1.1V

LG1154AN : 3.3V->2.5V->1.0V

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SECRET

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LG ELECTRONICS

BSD-NC4_H023-HD

MODEL	LG1154	DATE	2012-12-07
BLOCK	POWER	SHEET	/

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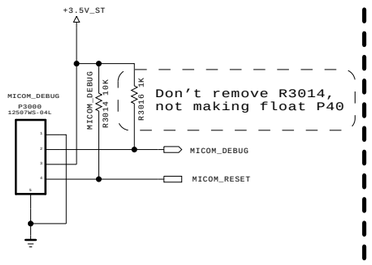
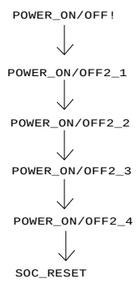
Renesas MICOM

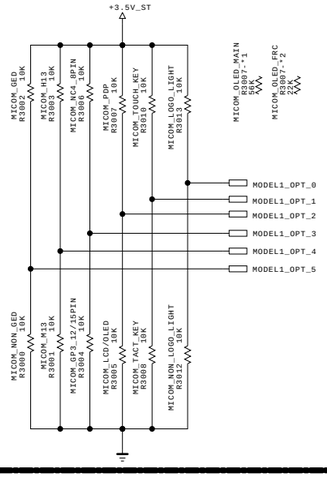
For Debug



GP4 High/MID Power SEQUENCE

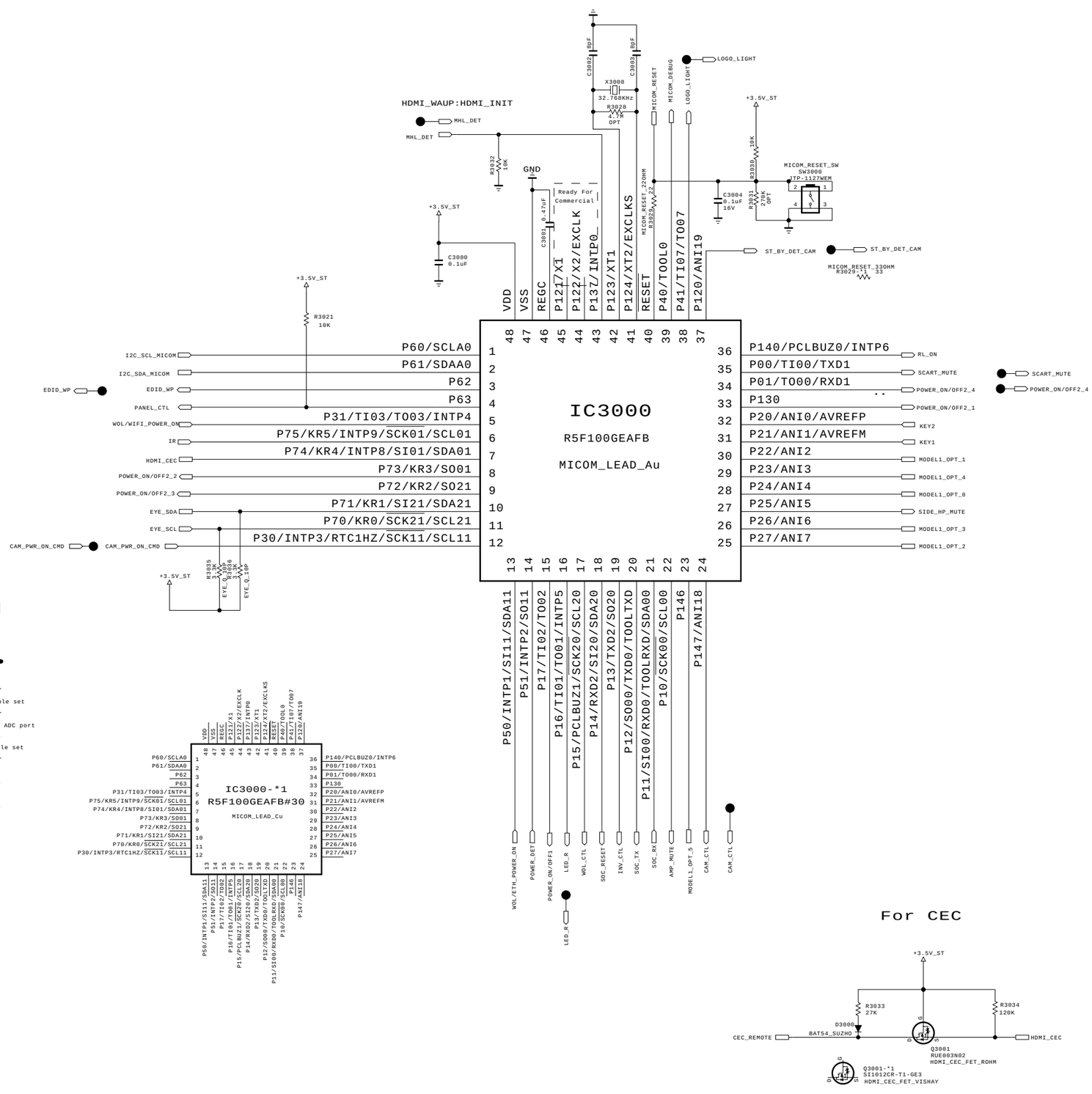


MICOM MODEL OPTION



MICOM MODEL OPTION

	0	1	
MODEL_OPT_0	NON LOGO	LOGO	For LOGO LIGHT
MODEL_OPT_1	TACT_KEY	TOUCH_KEY	Ready for sample set
MODEL_OPT_2	LCD / OLED	PDP	Need to Assign ADC port
MODEL_OPT_3	IR_wafer(12/15)	IR_wafer(10pin)	Ready for sample set
MODEL_OPT_4	M13	H13	
MODEL_OPT_5	NON_GED	GED	



For CEC

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LG ELECTRONICS

MODEL		DATE	2012.02.22
BLOCK	MICOM	SHEET	30

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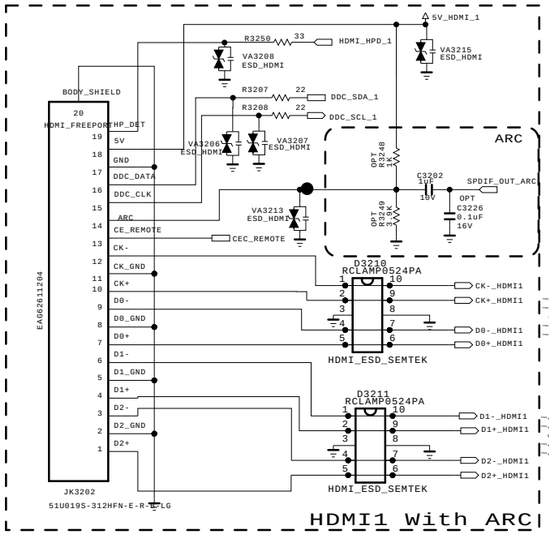

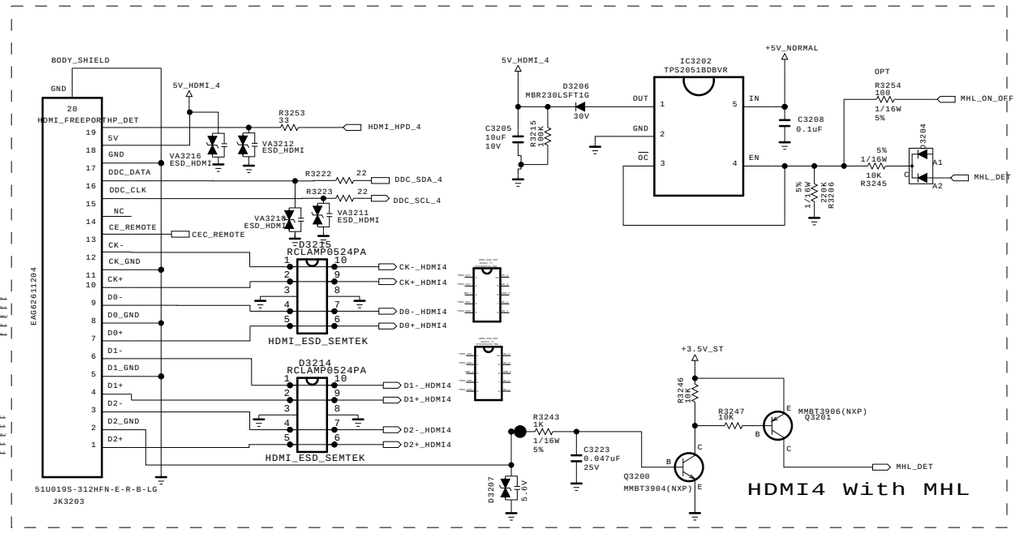

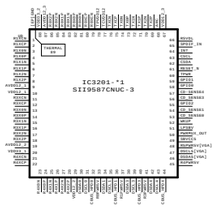

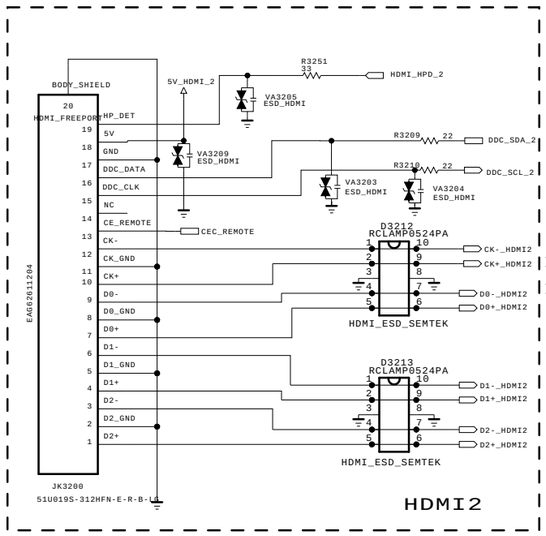

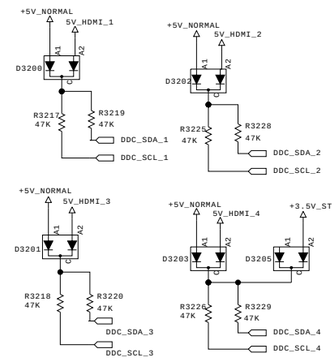

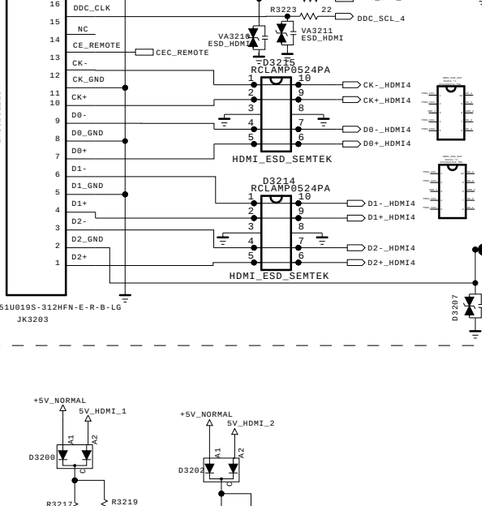

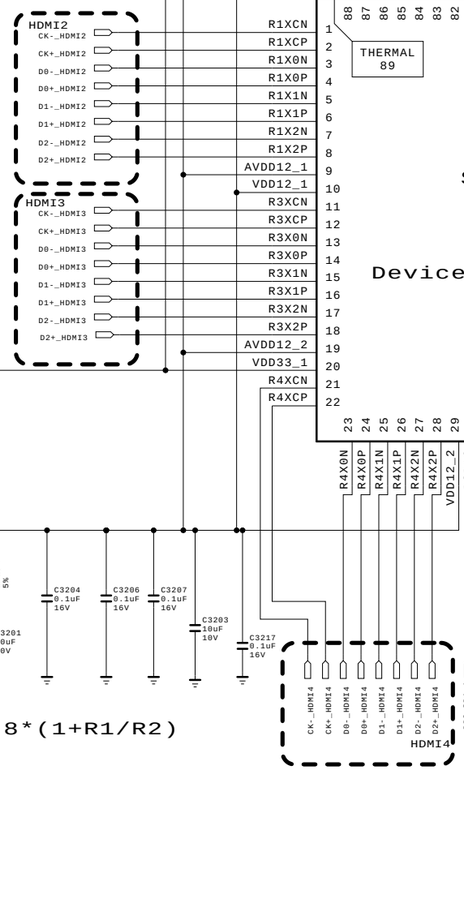

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LG ELECTRONICS

MODEL	GP4	DATE	
BLOCK	HDMI	SHEET	32

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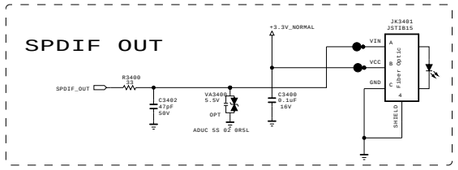
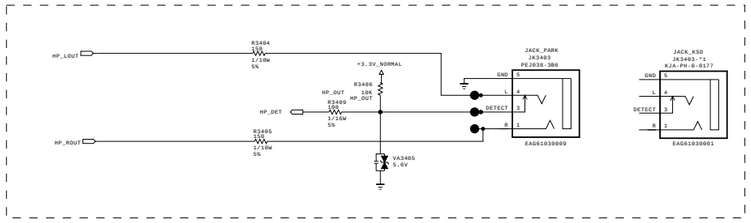
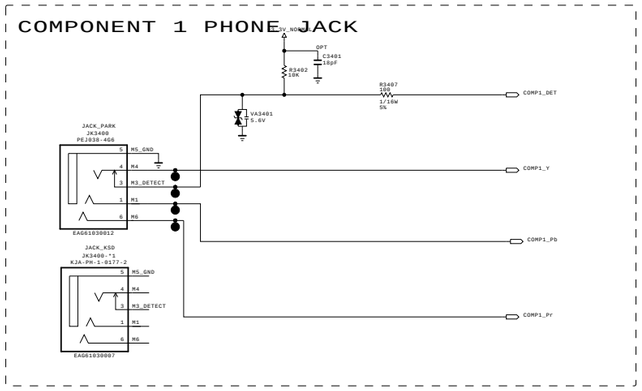
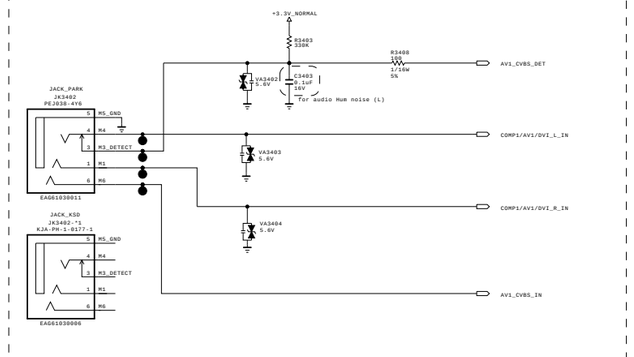


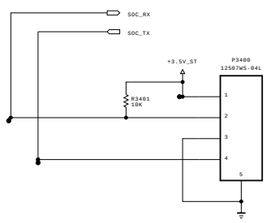


COMPONENT 1 PHONE JACK



CVBS 1 PHONE JACK





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SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION.
FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS
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THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
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LG ELECTRONICS

BSD-NC4_H034-HD

MODEL	JACK HIGH/MID	DATE	2012.10.09
BLOCK		SHEET	/

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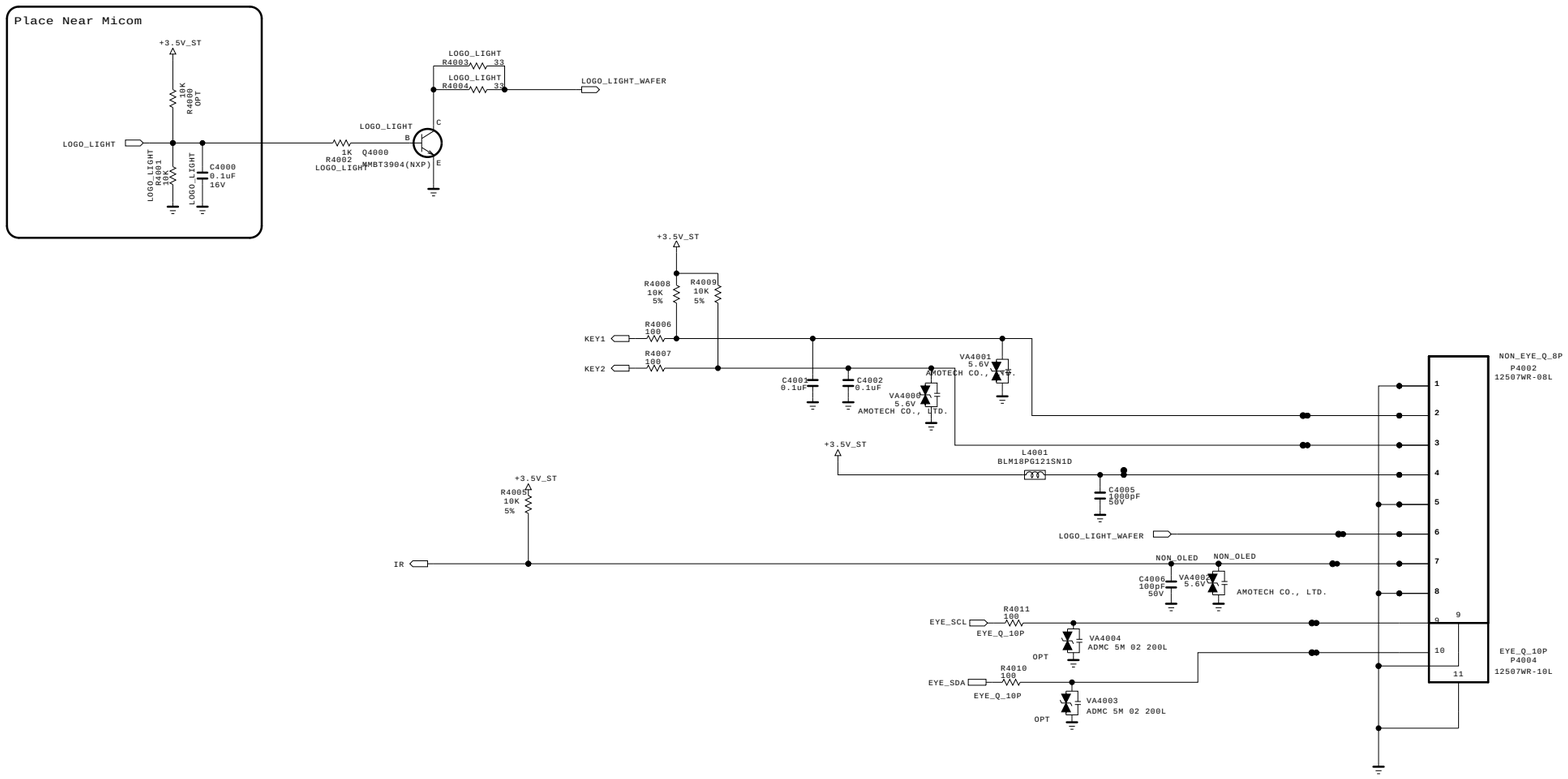

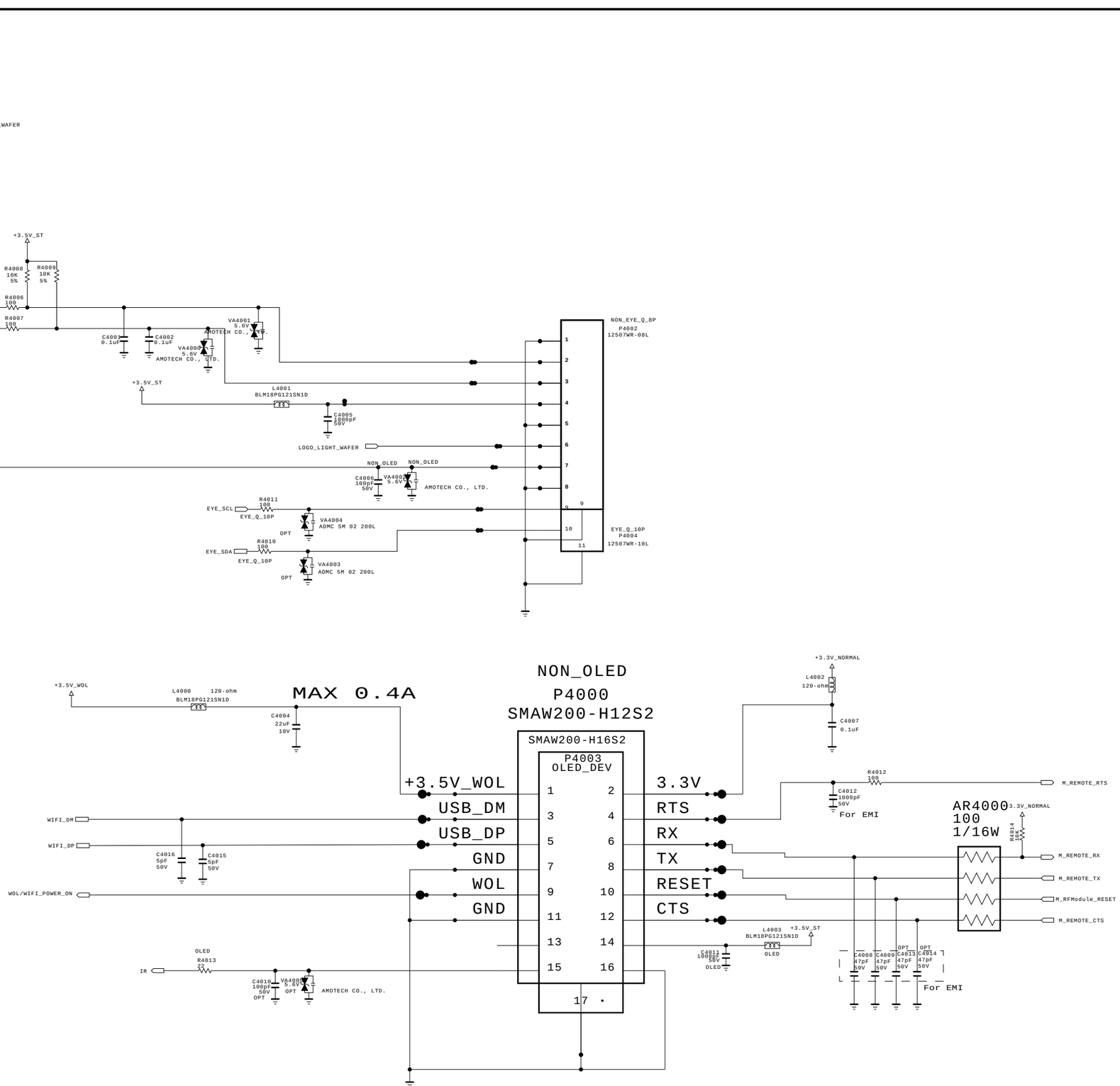

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SECRET
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LG ELECTRONICS

BSD-NC4_H040-HD

MODEL	IR / KEY	DATE	2012.10.10
BLOCK		SHEET	/

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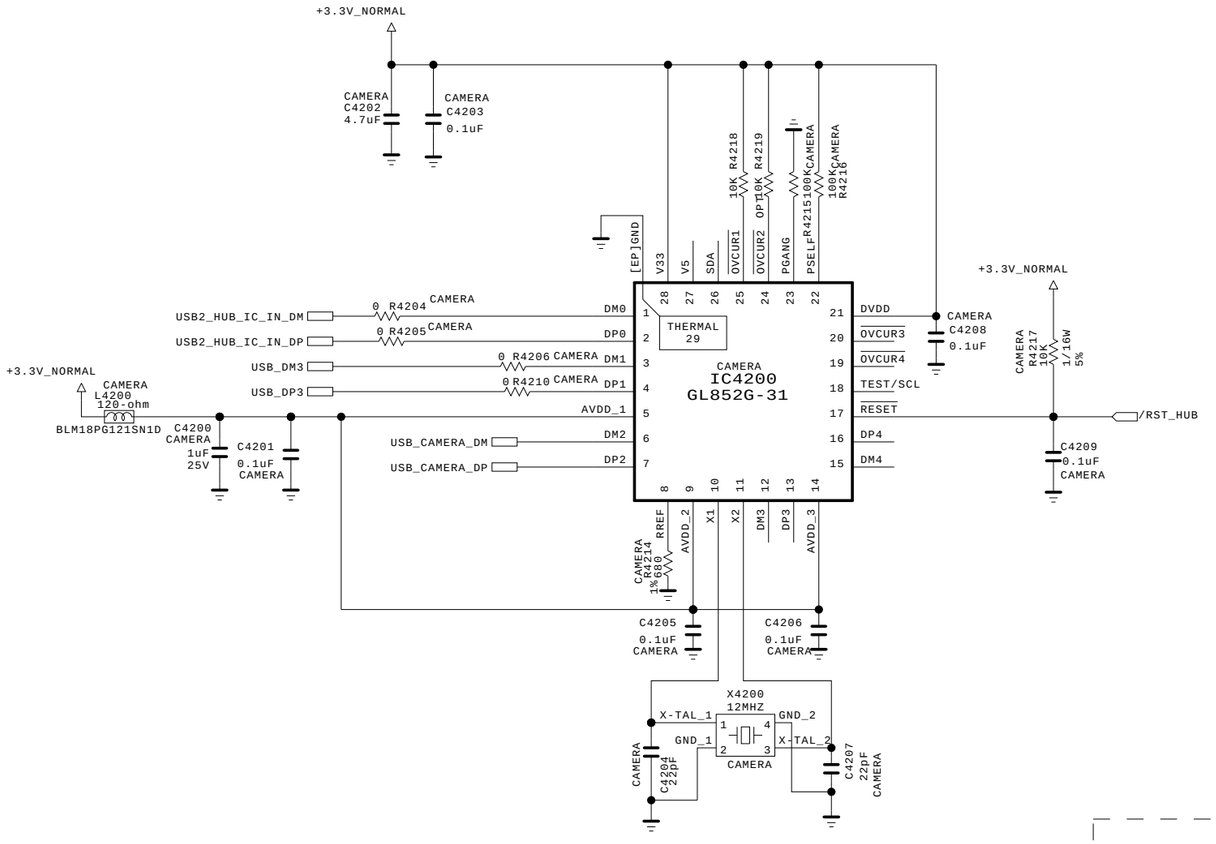

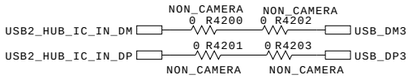

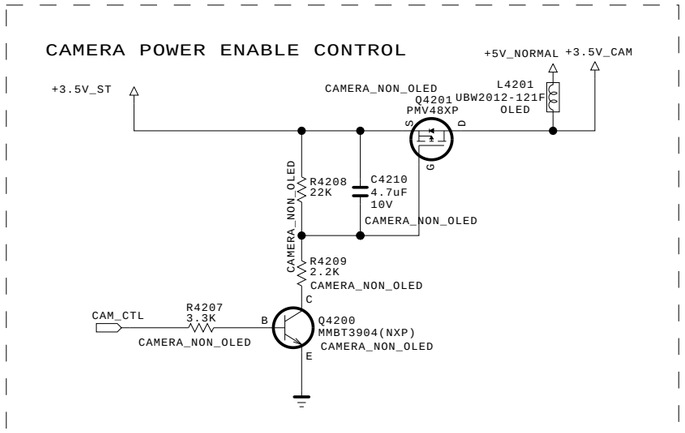

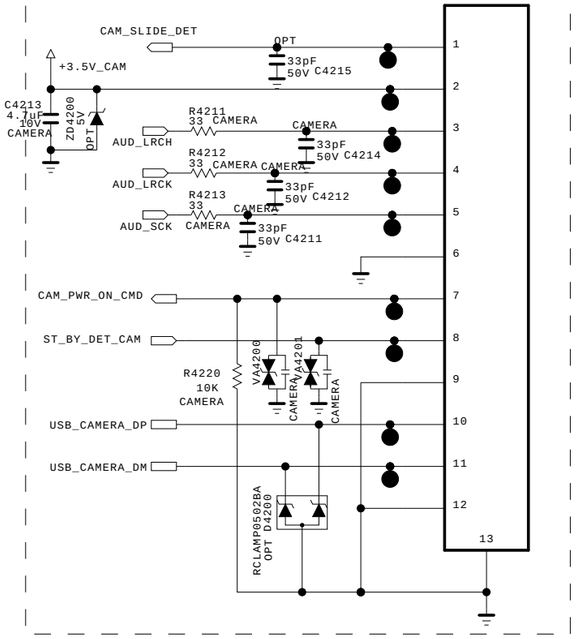

THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

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BSD-NC4_H042-HD

MODEL	USB3_HUB	DATE	2012.10.08
BLOCK		SHEET	/

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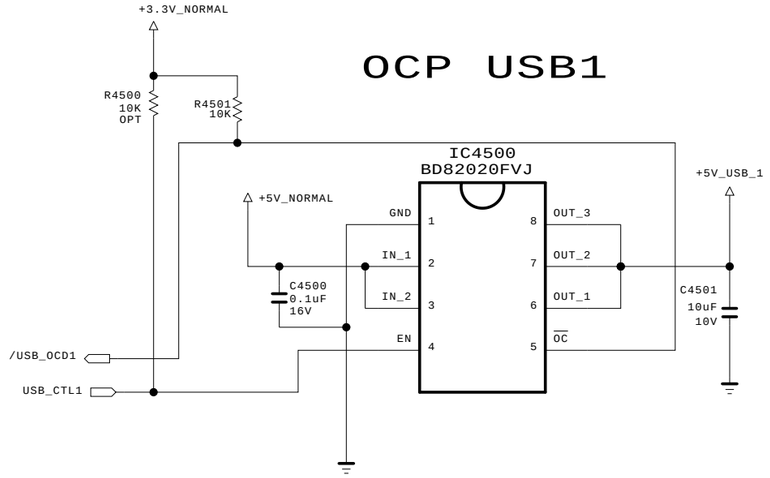
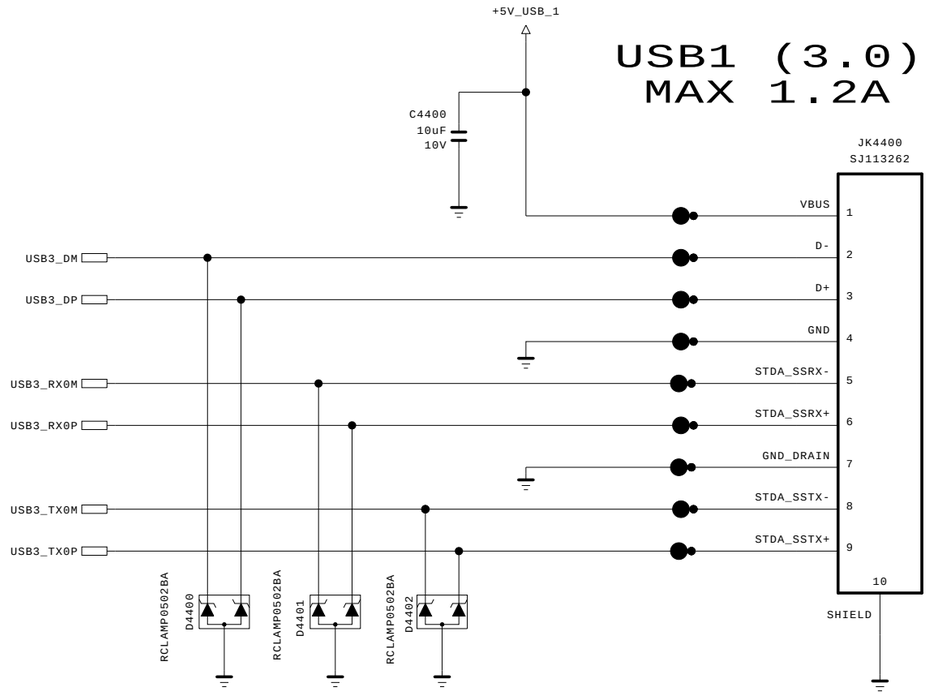
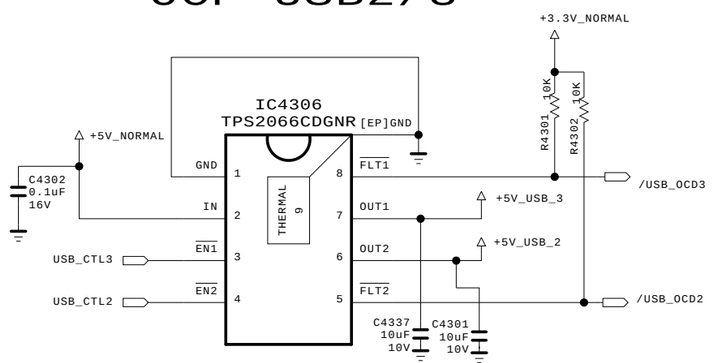
OCP USB1



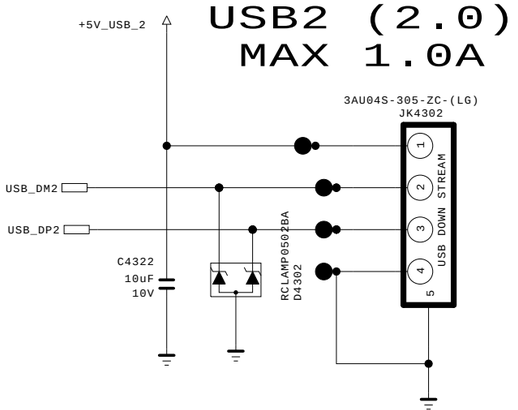
USB1 (3.0) MAX 1.2A



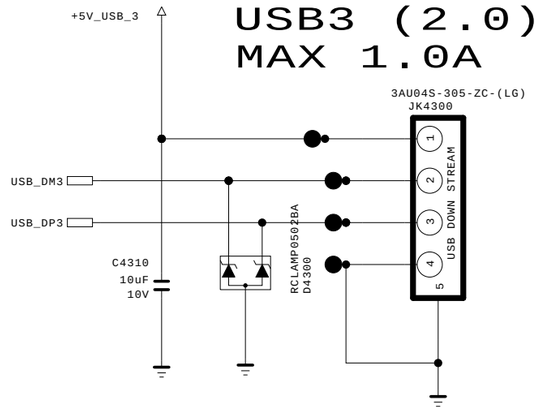
OCP USB2/3



USB2 (2.0) MAX 1.0A



USB3 (2.0) MAX 1.0A



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BSD-NC4_H044-HD

MODEL		DATE	2012-11-09
BLOCK	USB JACK	SHEET	/

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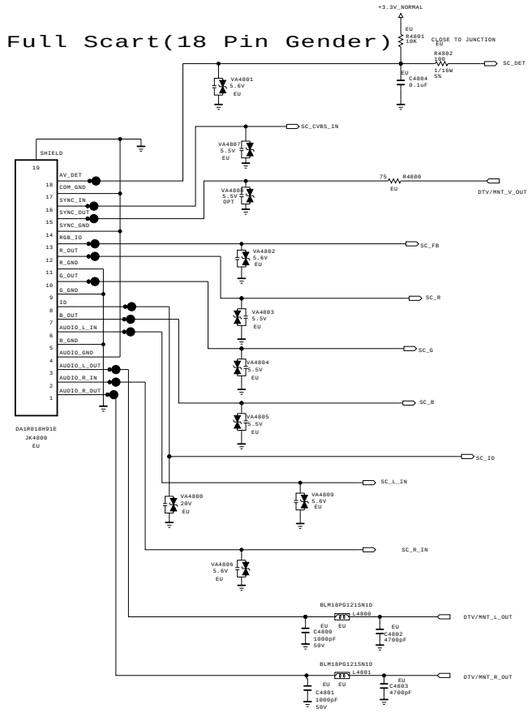
Full Scart(18 Pin Gender)



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BSD-NC4_H048-HD

MODEL		DATE	2012.10.31
BLOCK	SCART GENDER	SHEET	/

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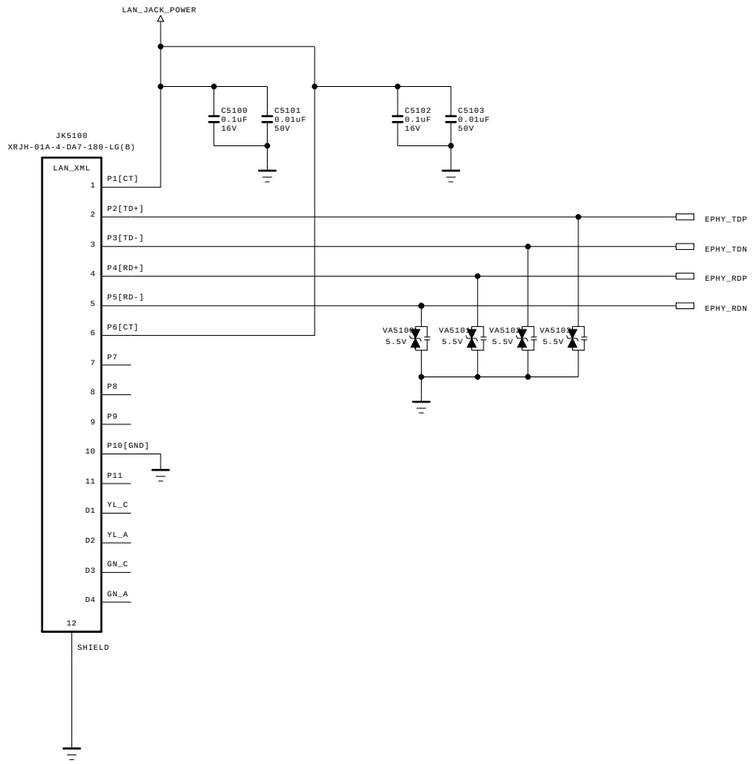
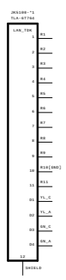
Ethernet Block





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MODEL	LAN_VERTICAL	DATE	2011.12.09
BLOCK		SHEET	50

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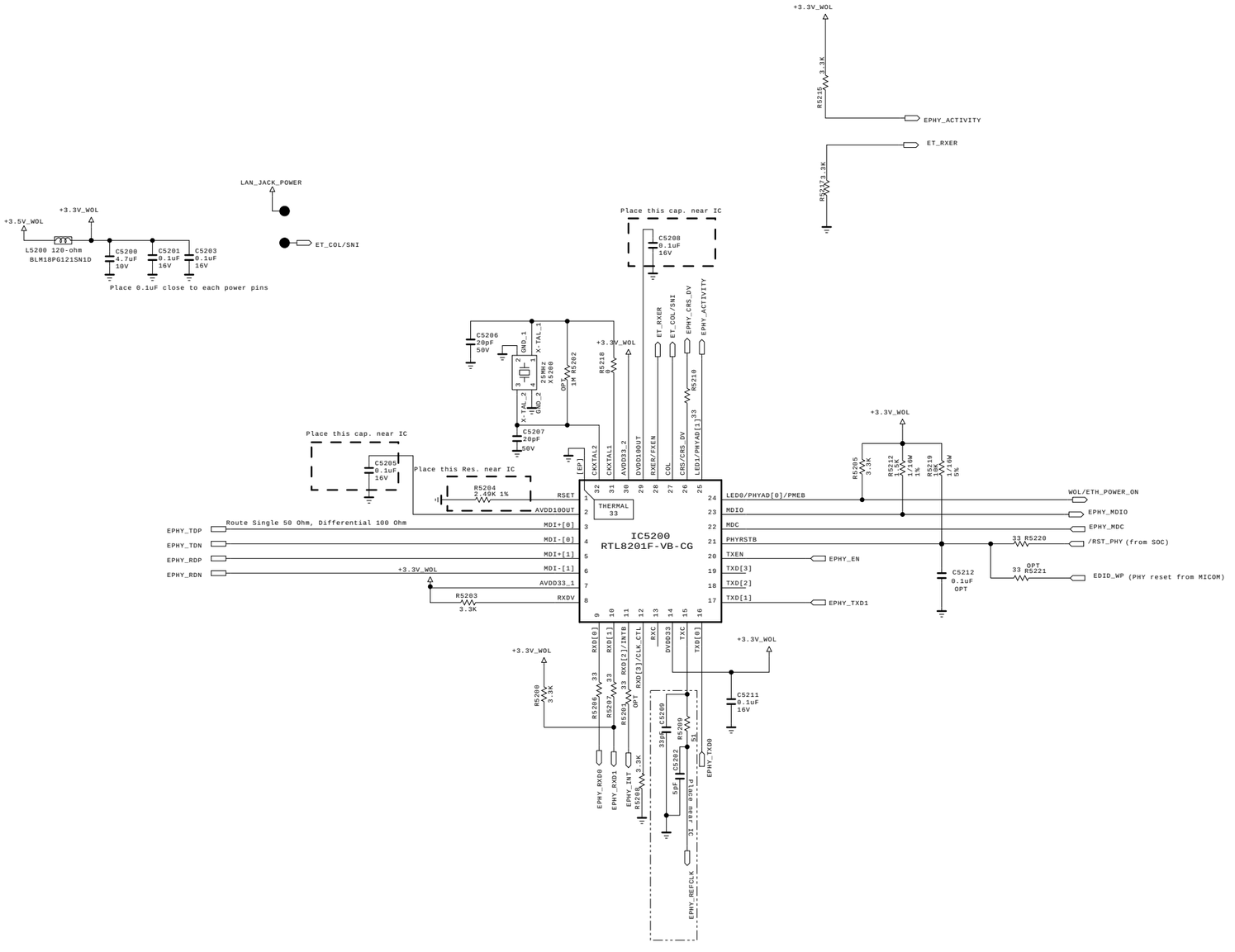
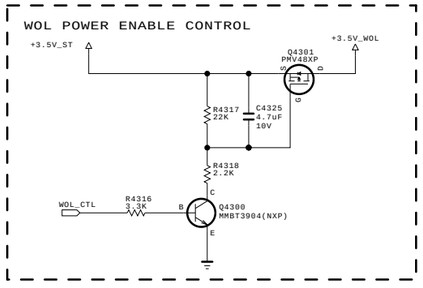
Ethernet Block





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BSD-NC4_H052-HD

MODEL		DATE	2012-09-12
BLOCK	ETHERNET	SHEET	/

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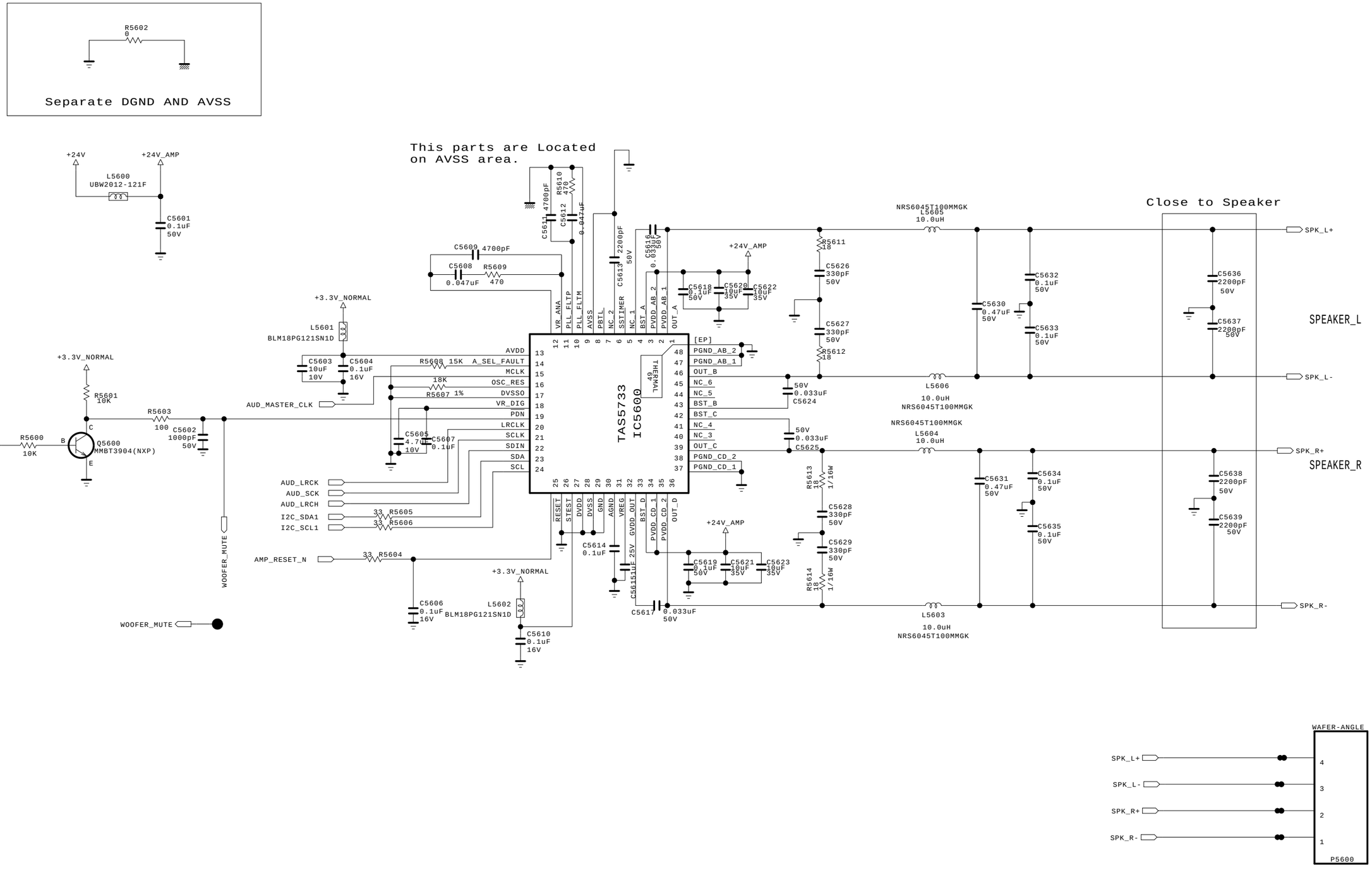

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MODEL	GP4_MT5369	DATE	2011.11.21
BLOCK	AUDIO[ST]	SHEET	58

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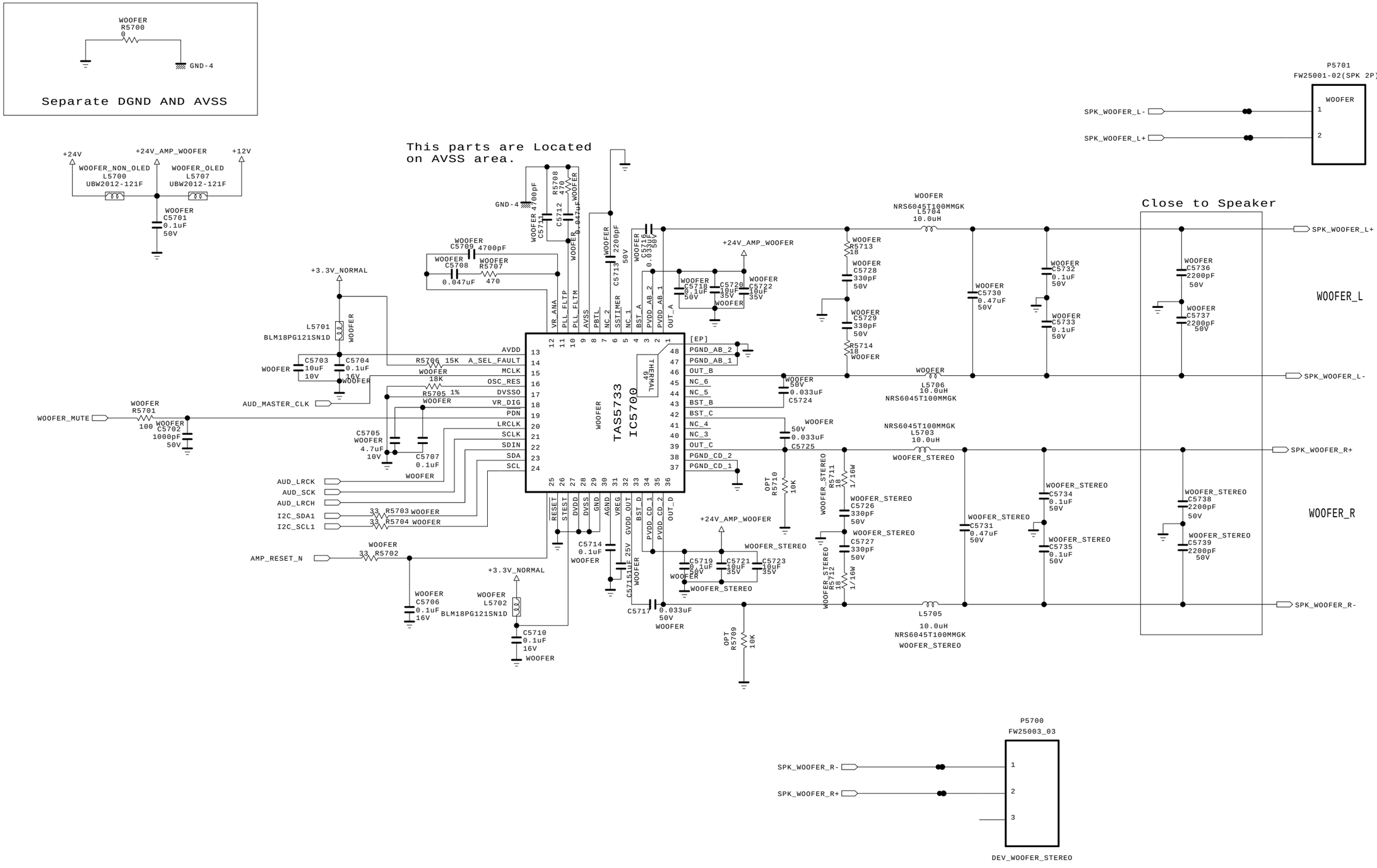

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MODEL	GP4_MT5369	DATE	2011.11.21
BLOCK	AUDIO[ST]	SHEET	58

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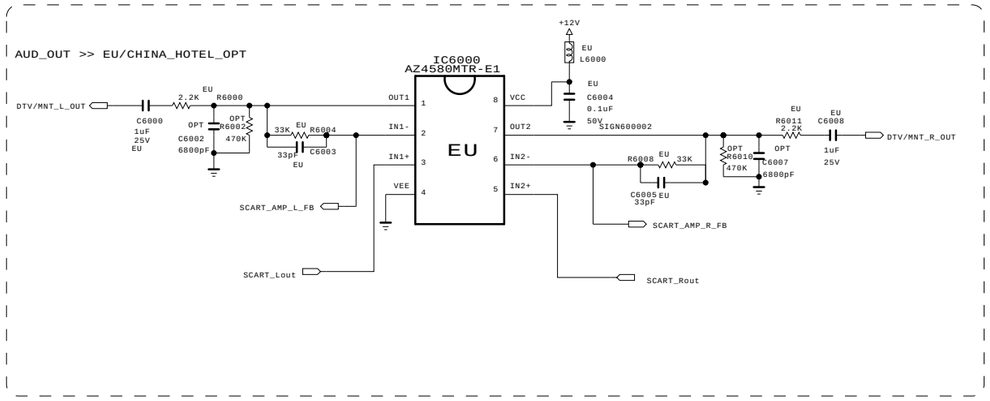

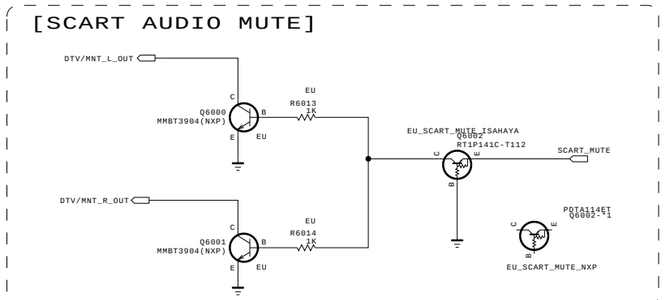

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MODEL	SCART AUDIO AMP	DATE	2011.11.21
BLOCK		SHEET	60

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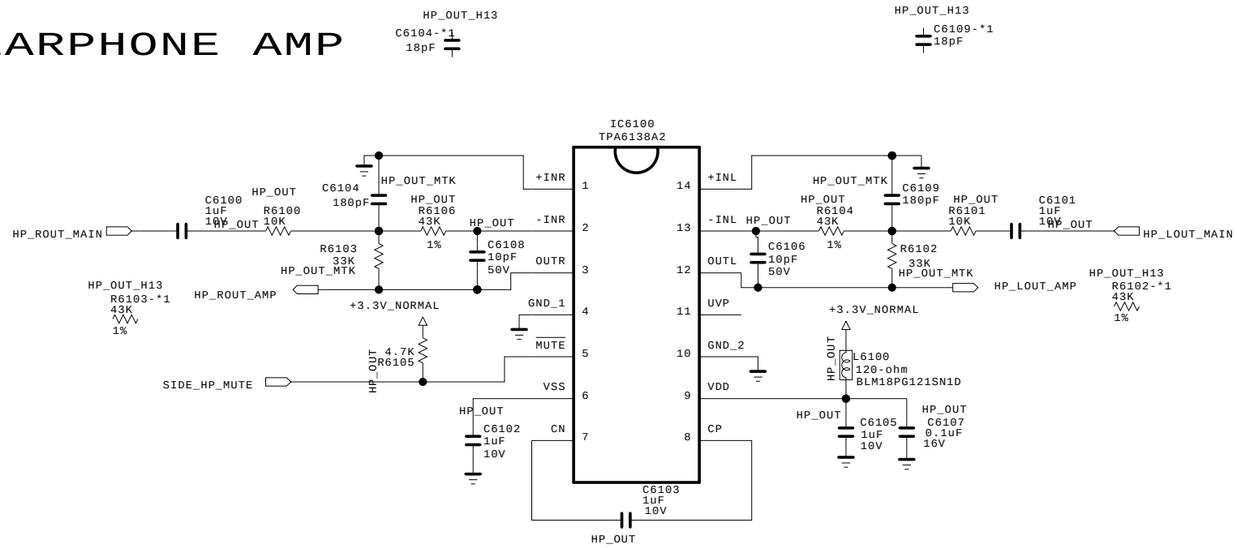
EARPHONE AMP



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MODEL	HEADPHONE AMP	DATE	2011.09.29
BLOCK		SHEET	61

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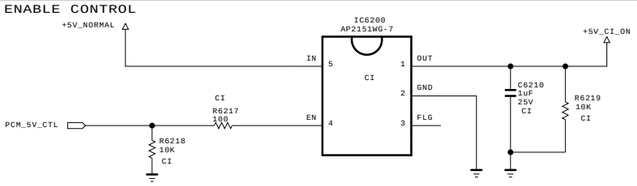
CI POWER ENABLE CONTROL



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MODEL	CI SLOT	DATE	2011.10.31
BLOCK		SHEET	62

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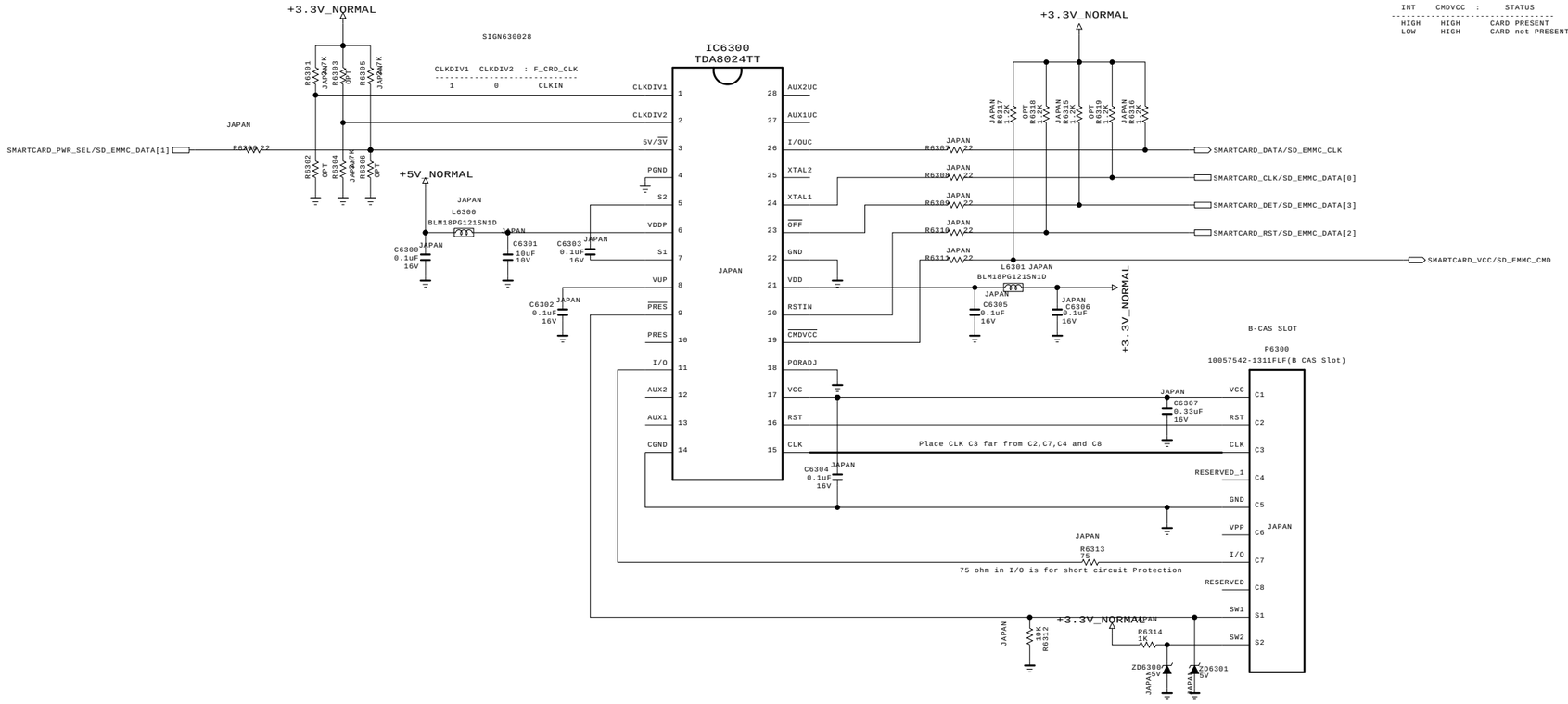
B-CAS (SMART CARD) INTERFACE



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MODEL	CI SLOT	DATE	2011.04.17
BLOCK		SHEET	62

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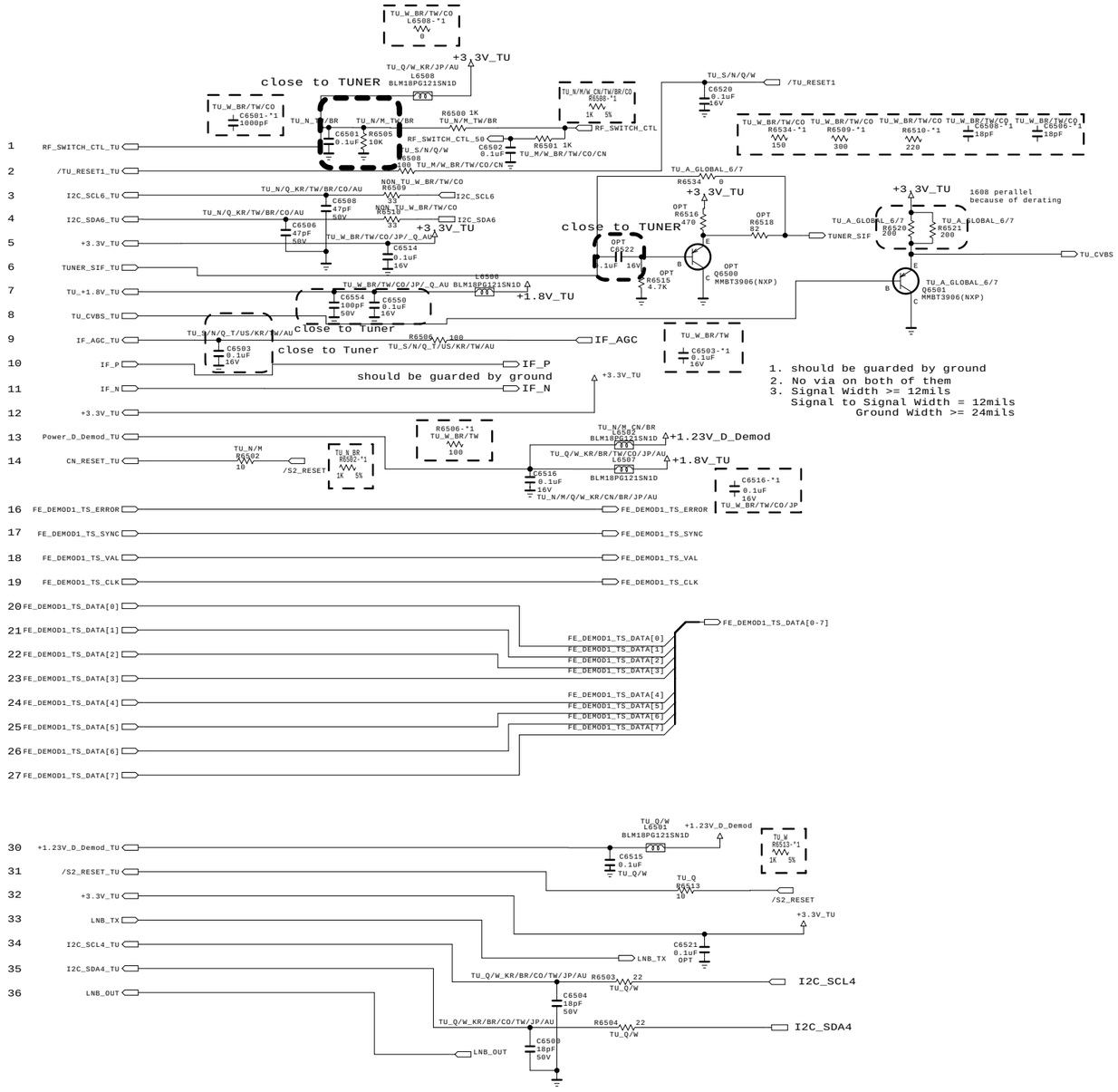

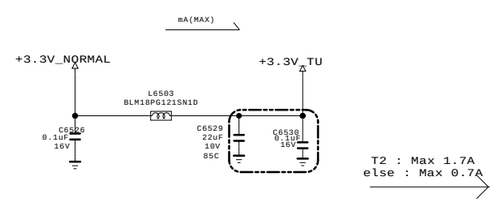

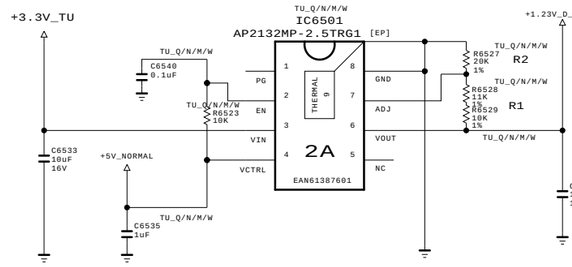

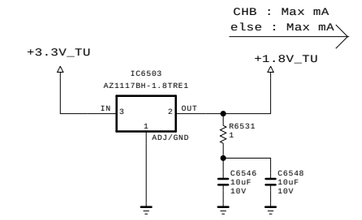

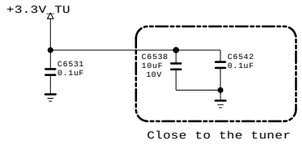

Global F/E Option Name
1. TU
2. Tuner Name = TDS'S',TDS'Q'...
3. Country Name = T,T2,S2,KR,US,BR ...

Example of Option name
TU_Q_T2 = apply TDSQ type tuner and T2 country
TU_M/W = apply TDSM&TDSW Type Tuner

13' Tuner Type for Global
TDS'S'-G501D : T/C Half NIM Horizontal Type
TDS'Q'-G501D : T/C/S2 Combo Horizontal type
TDS'Q'-G601D : T2/C/S2 Combo Horizontal Type
TDS'Q'-G651D : T2/C/S2 Combo Vertical Type
TDS'M'-C601D : China NIM with Isolater Type
TDS'W'-J551F : Japan Dual NIM
TDS'W'-B651F : Brazil 2Tuner
TDS'W'-A651F : Taiwan 2Tuner
TDS'W'-K651F : Colombia DVB-T2 2Tuner

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MODEL	TUNER	DATE	2012.07.10
BLOCK		SHEET	65

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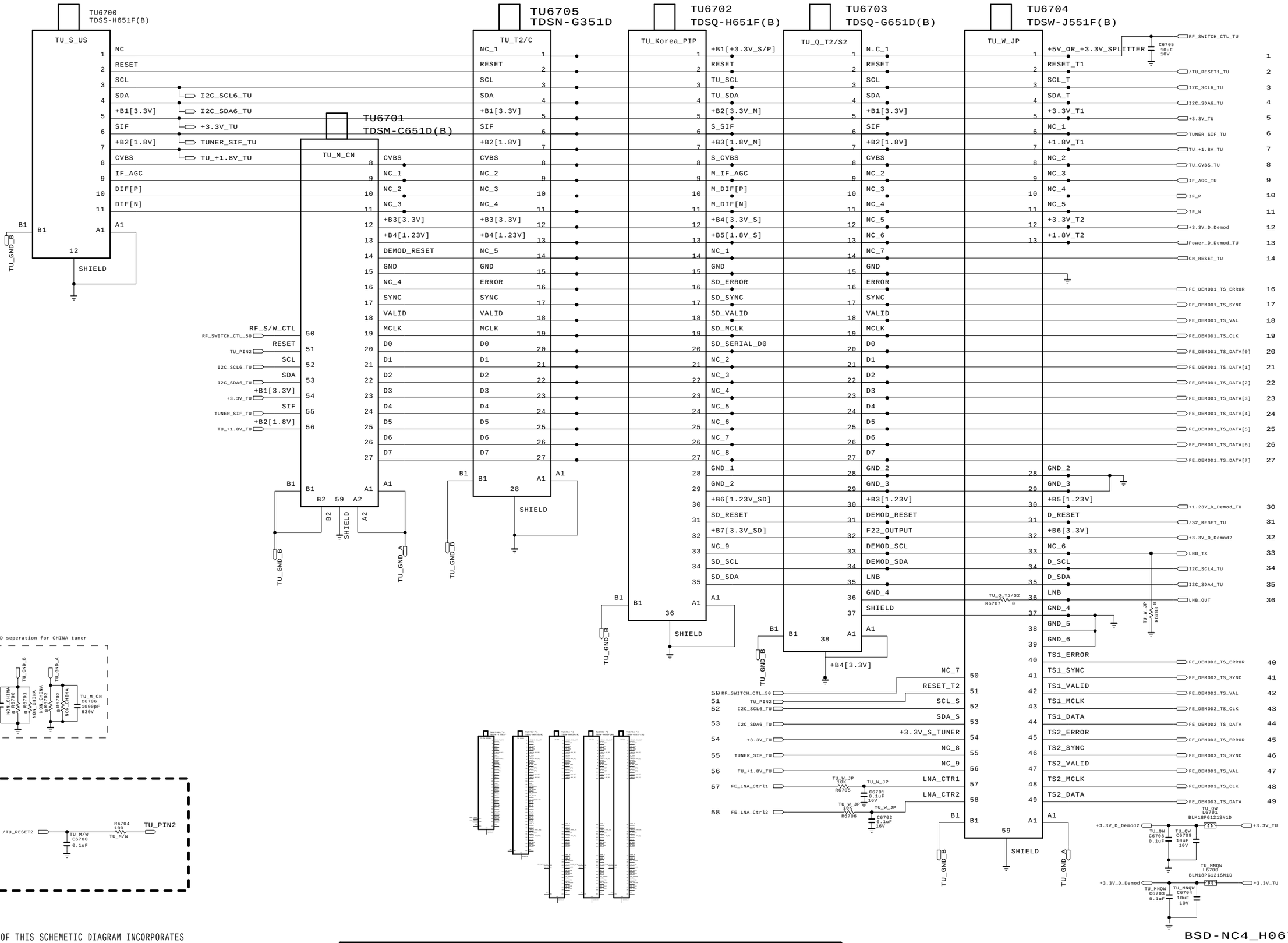

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BSD-NC4_H067-HD

MODEL	TU_SYMBOL	DATE	2012.09.14
BLOCK		SHEET	/

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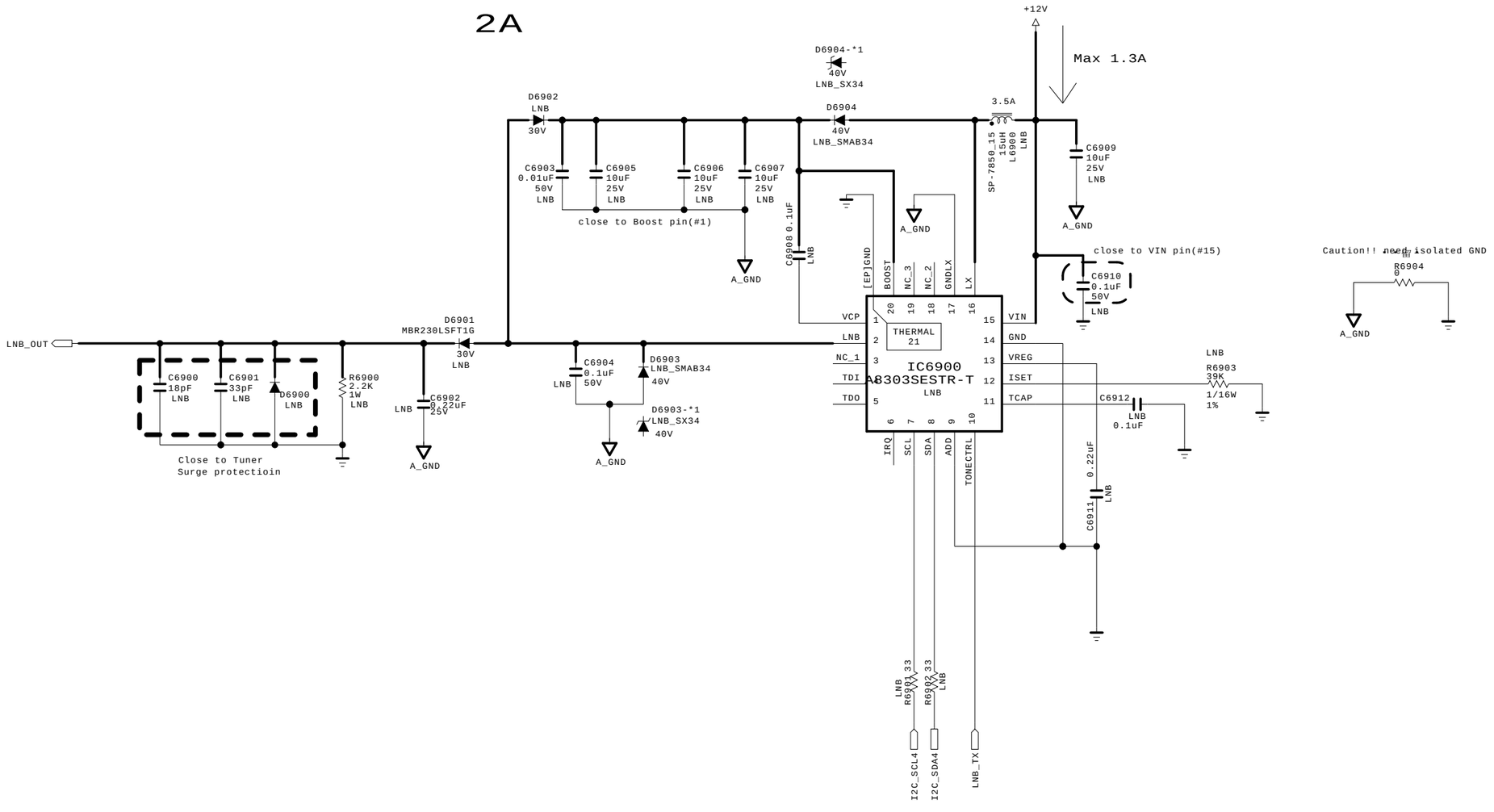
DVB-S2 LNB Part Allegro

(Option:LNB)

3A

Input trace widths should be sized to conduct at least 3A
Ouput trace widths should be sized to conduct at least 2A



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MODEL	LNB	DATE	2012.03.08
BLOCK		SHEET	69

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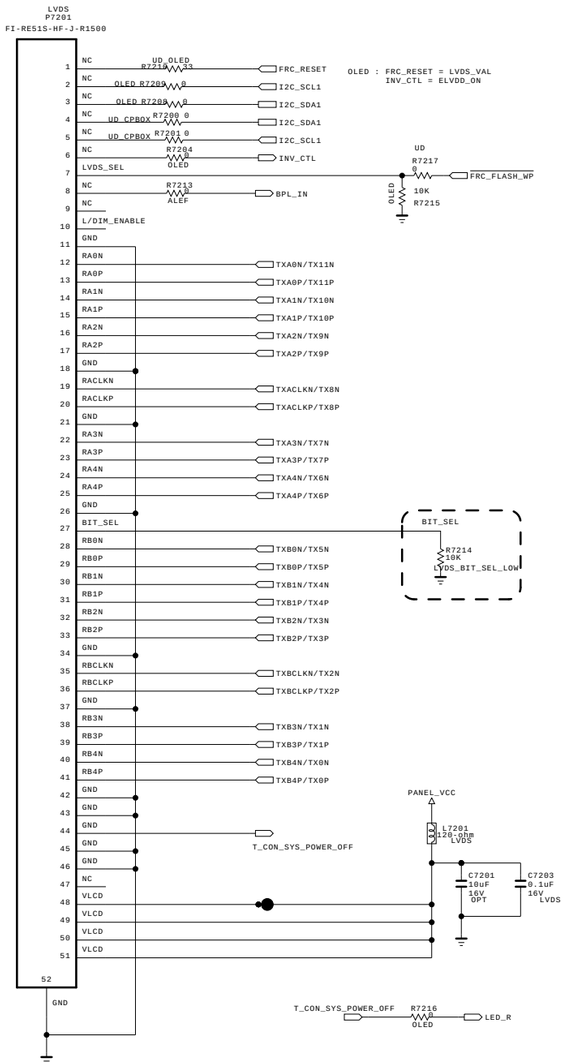
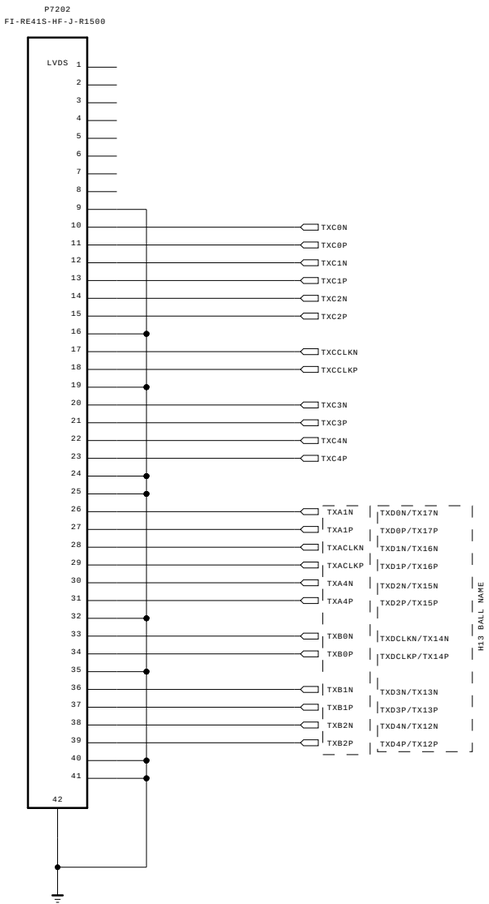
LVDS

[51Pin LVDS OUTPUT Connector]



[41Pin LVDS OUTPUT Connector]



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BSD-NC4_H072-HD

MODEL		DATE	2012-10-15
BLOCK	LVDS INTERFACE	SHEET	/

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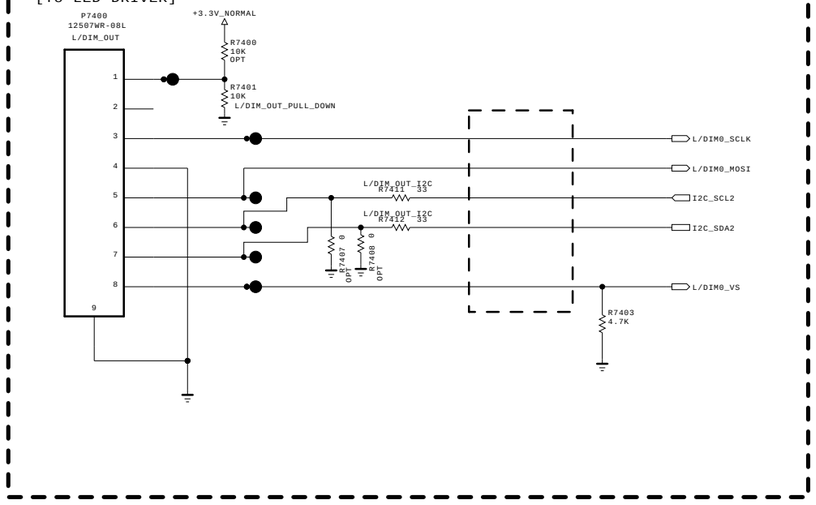
LOCAL DIMMING 1

[To LED DRIVER]



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BSD-NC4_H074-HD

MODEL	LOCAL DIMMING	DATE	2012.09.14
BLOCK		SHEET	/

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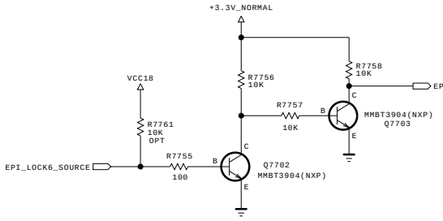
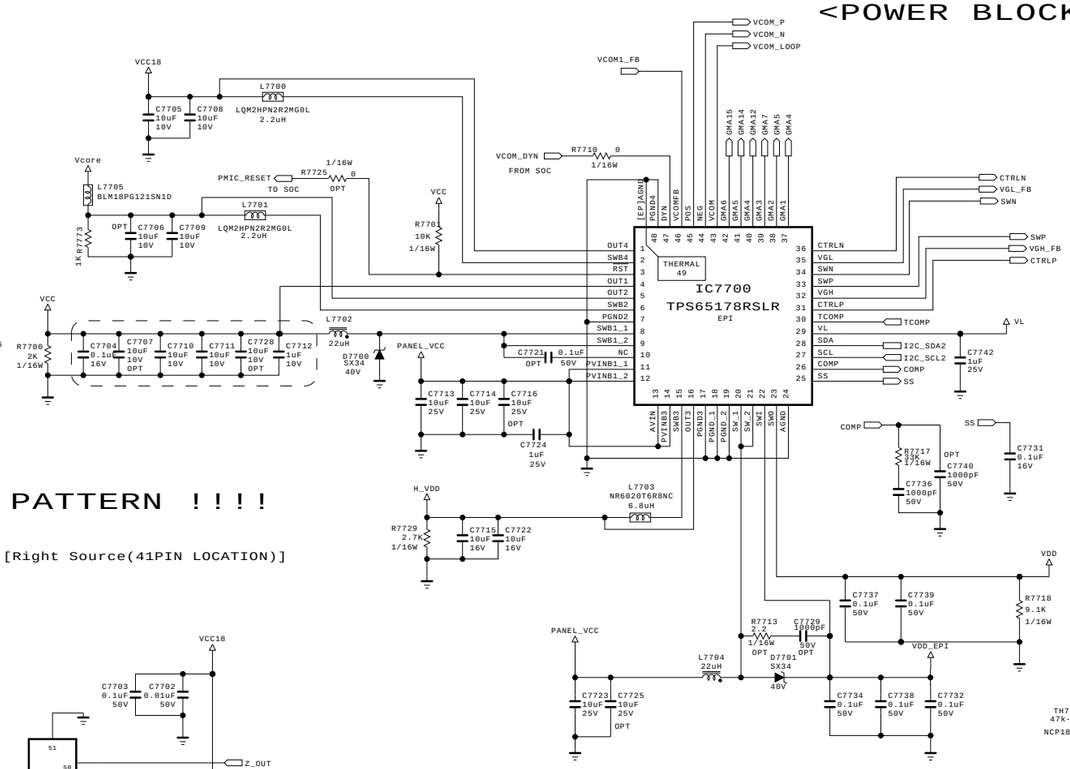
<POWER BLOCK>

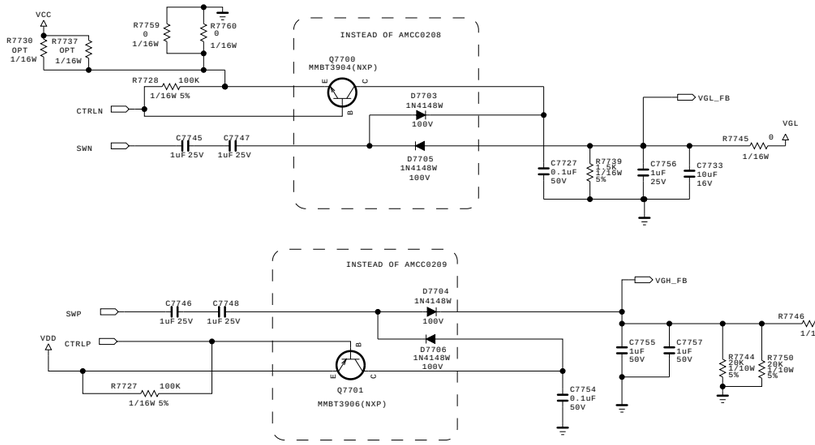


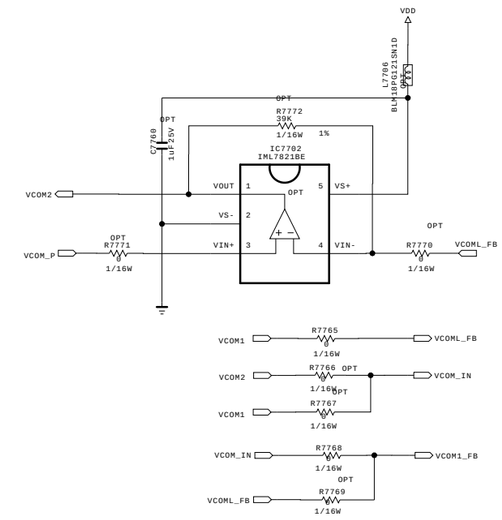
THIS IS REVERSE PATTERN !!!!

[Left Source(51PIN LOCATION)]

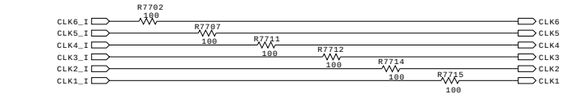
[Right Source(41PIN LOCATION)]

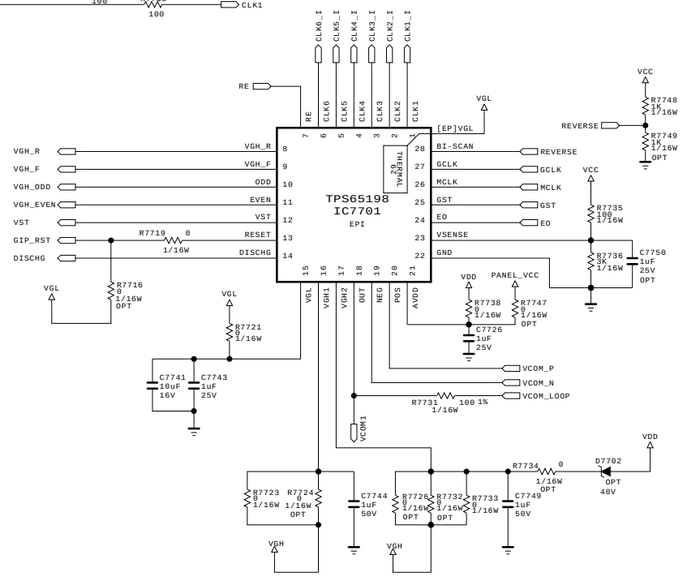


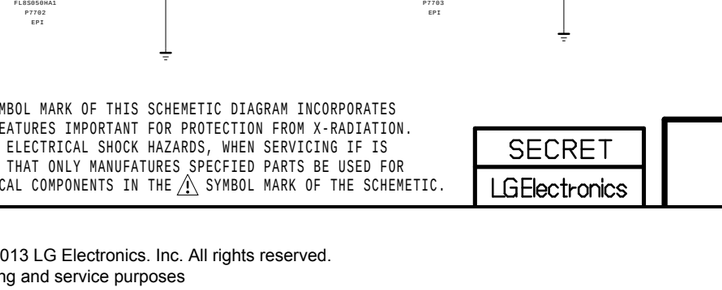


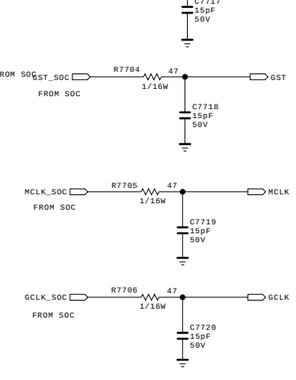


<LEVEL SHIFTER BLOCK>









THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET

LGElectronics

LG ELECTRONICS

MODEL		DATE	2011.12.01
BLOCK	T-Con	SHEET	77

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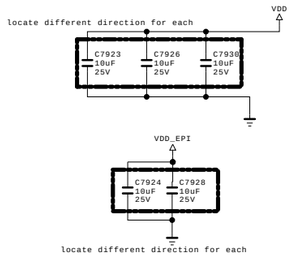

THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

LG ELECTRONICS

BSD-NC4_H079-HD

MODEL		DATE	2012.09.14
BLOCK	EPI_CAP	SHEET	/

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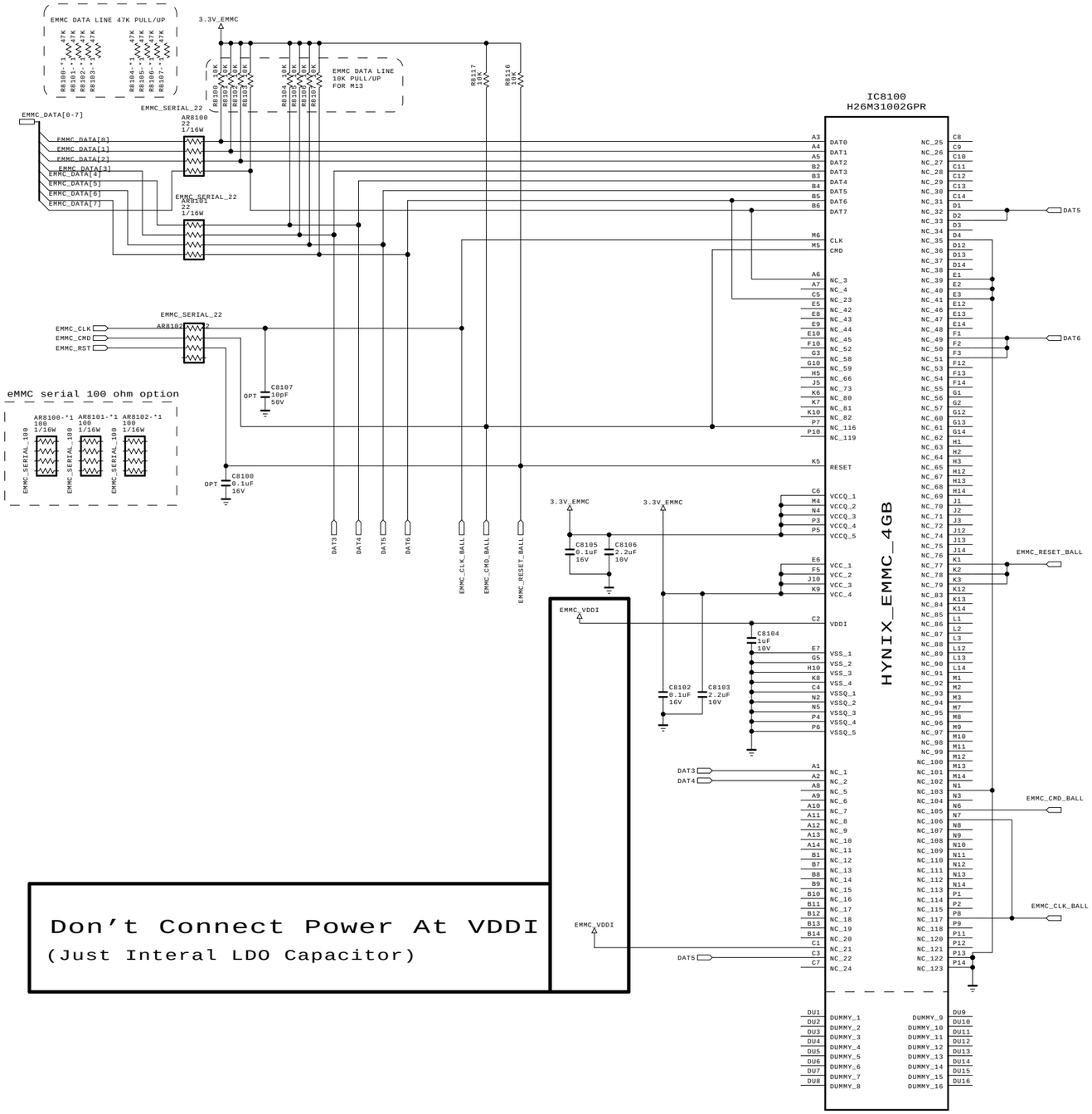
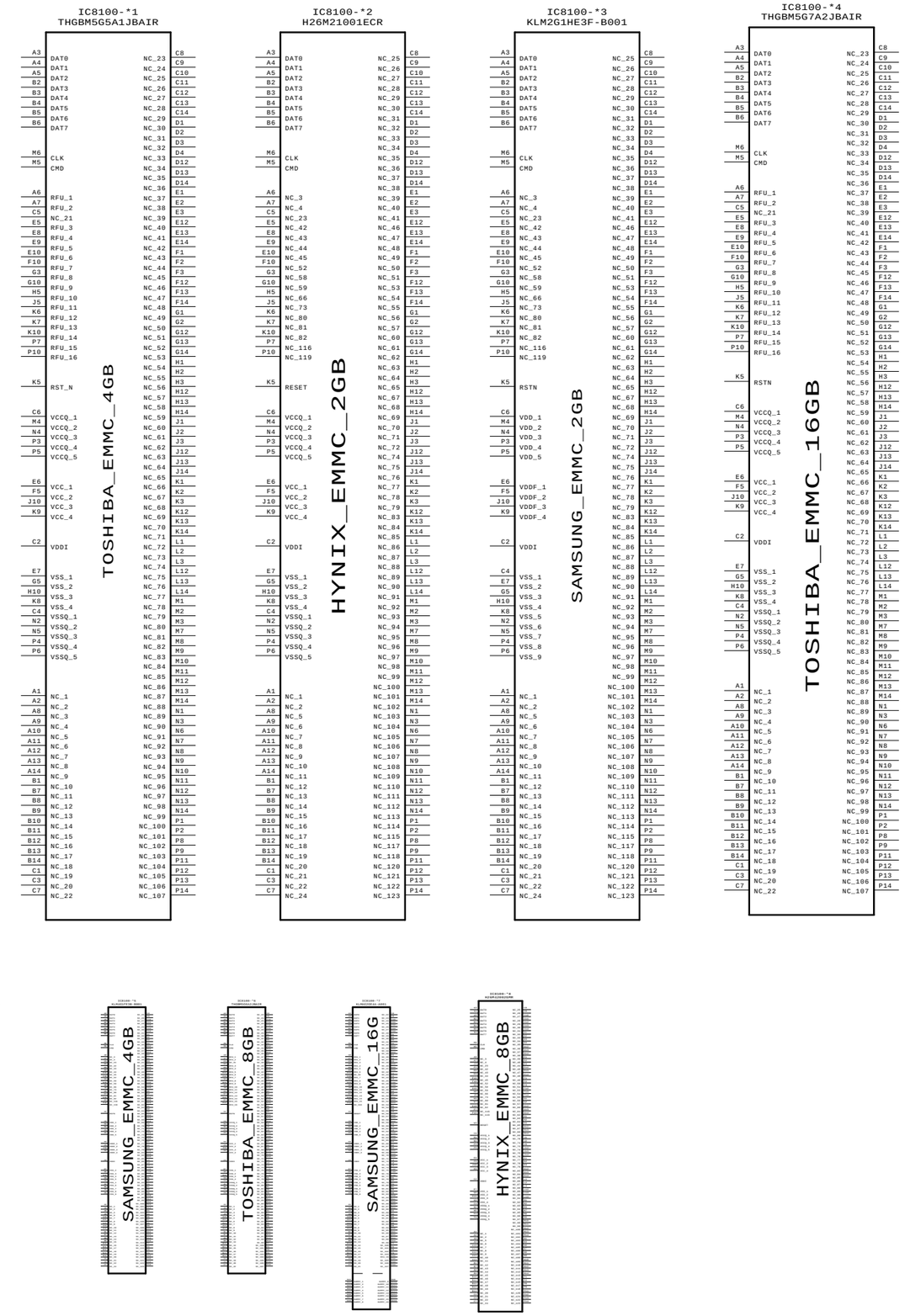
eMMC I/F



Don’t Connect Power At VDDI
(Just Interal LDO Capacitor)



THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FIRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

LG ELECTRONICS

MODEL	eMMC	DATE	11.09.29
BLOCK		SHEET	81

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LG
Life's Good

2013 LED/LCD TV
Engineering guide

< Applicable Model : High-end Platform >

EPI Interface

- EPI(Embedded Point-Point Interface)
- Features
  - **Point-Point topology (support 2 Pair option)**
  - **CDR (Clock Data Recovery)**
  - **Bandwidth up to 1.85Gbps/pair at FHD 120Hz 10 bit application**
  - **Lock signal cascading and feedback to T-Con**
  - **Embedded Control Data**
- Merits
  - **Better reliability on common noise**
  - **No data skew and better EMI margin**
  - **Fewer lines than mini-LVDS**
  - **Slim PCB design**

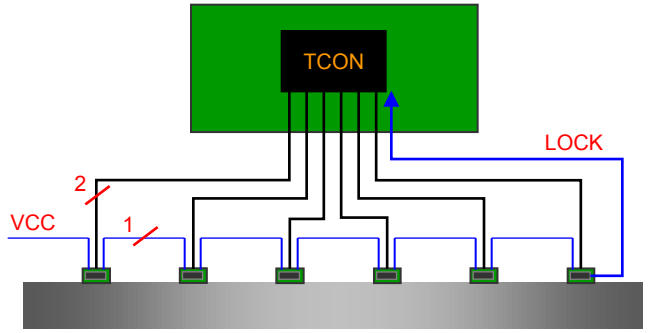


Figure1. Topology

Table 1. Example of FHD 120Hz TV

EPI	FHD (10bit) @ 960Ch		
	60Hz	120Hz	240Hz
Transmission Line	12	12	24
Bandwidth	0.84Gbps	1.68Gbps	1.68Gbps

EPI Interface (mini-LVDS vs. EPI)

Comparison

HF mini-LVDS

HF mini-LVDS	FHD (10bit)		
	60Hz	120Hz	240Hz
No. of Signal	36	36	72
Connector	60pin (2ea)	60pin (2ea)	80pin (2ea)

-Difficult to upgrade bandwidth limit
-Multiple number of wires needed for higher bandwidth

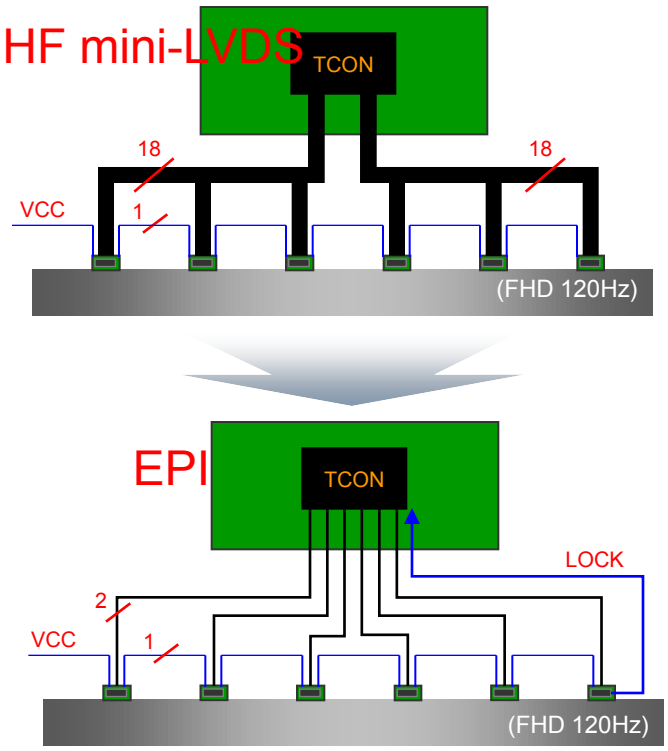
EPI (Embedded clock P-to-P Interface)

EPI	FHD (10bit)		
	60Hz	120Hz	240Hz
	960ch	960ch	720ch
No. of Signal	12	12	32
Connector	-	50 pin (2ea)	70pin (2ea)

-Better reliability on common noise
-No data skew. Better EMI margin
-Lower cost (Cable, Connector)
-Slim S-PCB design (14mm → 10mm) helps slimmer TV

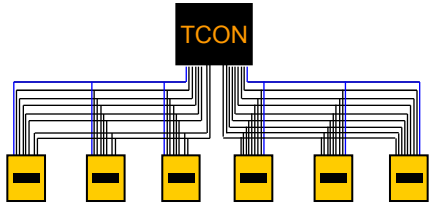
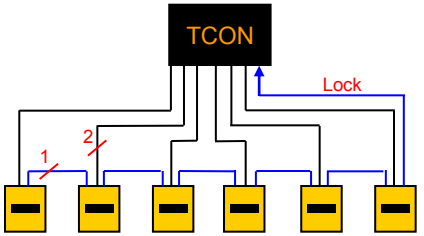
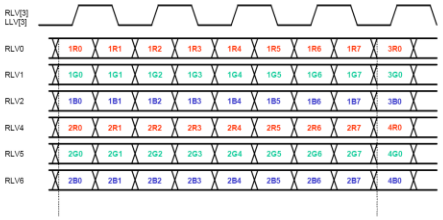
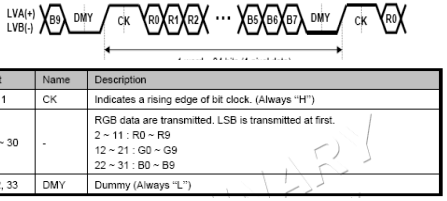
What to change

LCM (T-con to S-Driver IC)



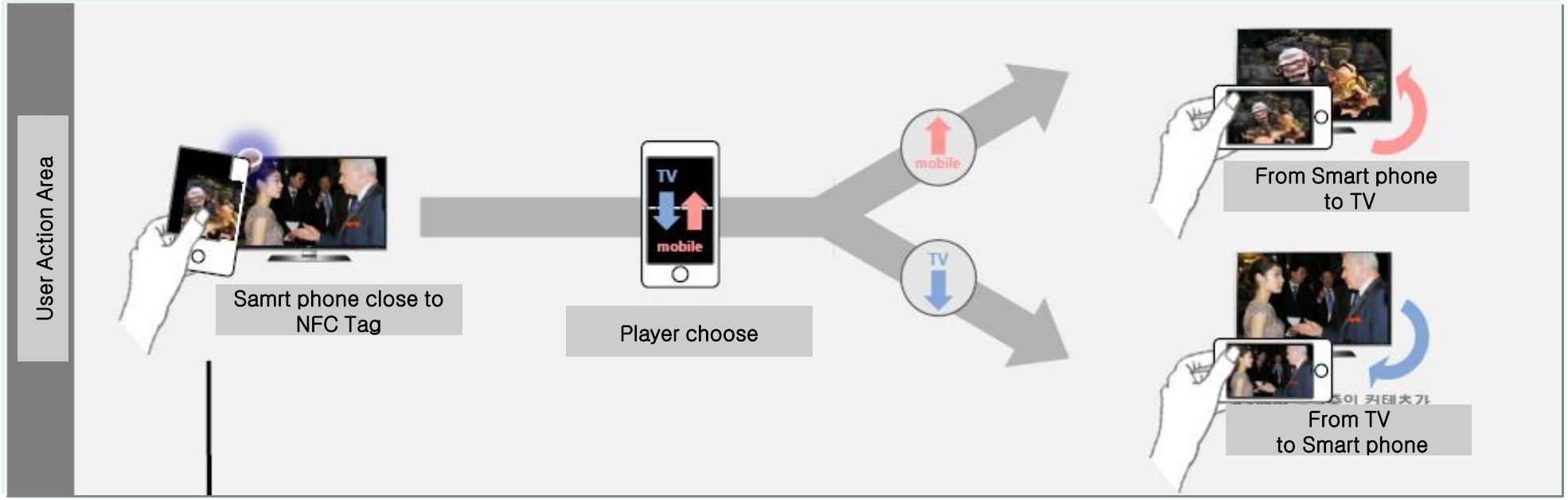
* Bandwidth Capability
- FHD 120Hz 10Bit : 594Mbps@36Lines → 1.65Gbps@12Lines
- FHD 240Hz 10Bit : 594Mbps@72Lines → 1.25Gbps@32Lines

EPI Interface (mini-LVDS vs. EPI)

	HF mini-LVDS	EPI
Topology		
Protocol		 Bit / Name / Description 0, 1 / CK / Indicates a rising edge of bit clock. (Always "H") 2 ~ 30 / - / RGB data are transmitted. LSB is transmitted at first. 2 ~ 11 : R0 ~ R9 12 ~ 21 : G0 ~ G9 22 ~ 31 : B0 ~ B9 32, 33 / DMY / Dummy (Always "L")
Features @10bit, FHD120	• Multi Drop • Data rate: 660Mbps • External clock	• Point to Point • Data rate : 1.8Gbps • Embedded clock, Control
Merit	• Simple structure • Standardization	• Fewer Lines : 12 • Embedded clock : low EMI, Clock skew free • Easy to PCB design
Demerit	• Too many lines : 36 • Clock skew • EMI due to clock lines • Bandwidth limit	• Transmission Overhead : 4bit delimiter

NFC (Near field communication)

Near field communication (NFC) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few centimetres. Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi. Communication is also possible between an NFC device and an unpowered NFC chip, called a "tag".



Tag On

Touch the smartphone to the Tag On sticker.

- Using an LG smartphone with the NFC and Miracast functions, you can:
  - TV to Phone: run the LG TV Remote app on the smartphone.
  - Phone to TV: view the screen of the smartphone on the TV.

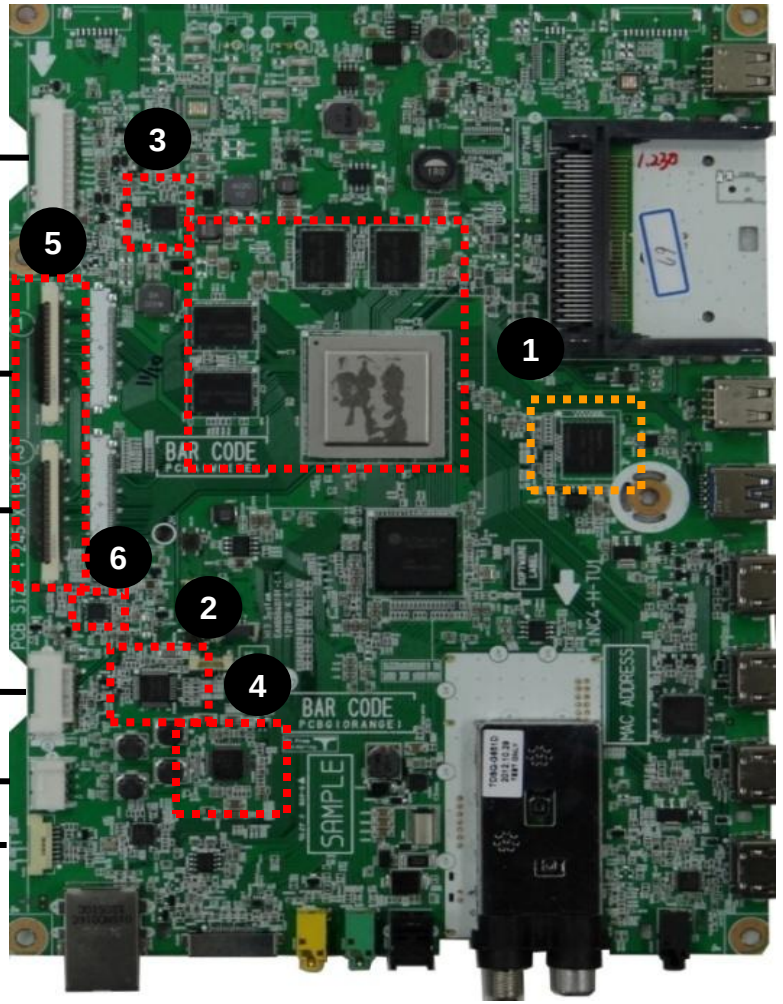
  To end the connection, touch the smartphone to the Tag On sticker again.
  (You can also disable the Miracast function on the smartphone.)

Main PCB for Broadband

Main + TCON all in one

xxLA790V-Zx

Chassis : LD34D
PCB P/No : EAX65040103



To PSU

To module

WIFI/BT

Front Spk

Key+IR+Logo

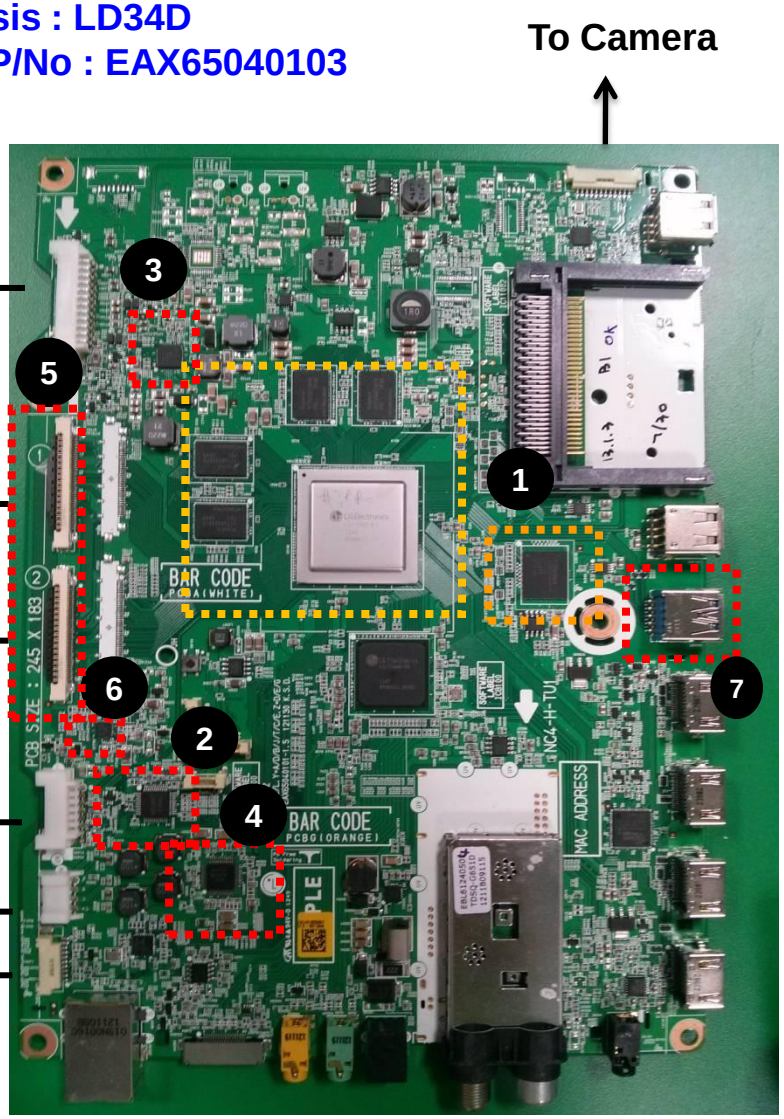
1. Main processor, DDR Memory eMMC Memory
2. Micom for Key/IR/Logo sensing
3. PMIC
4. Audio AMP
5. EPI Wafer
6. Level shifter

Main PCB for Broadband

Main + TCON all in one

xxLA860V-Zx

Chassis : LD34D
PCB P/No : EAX65040103



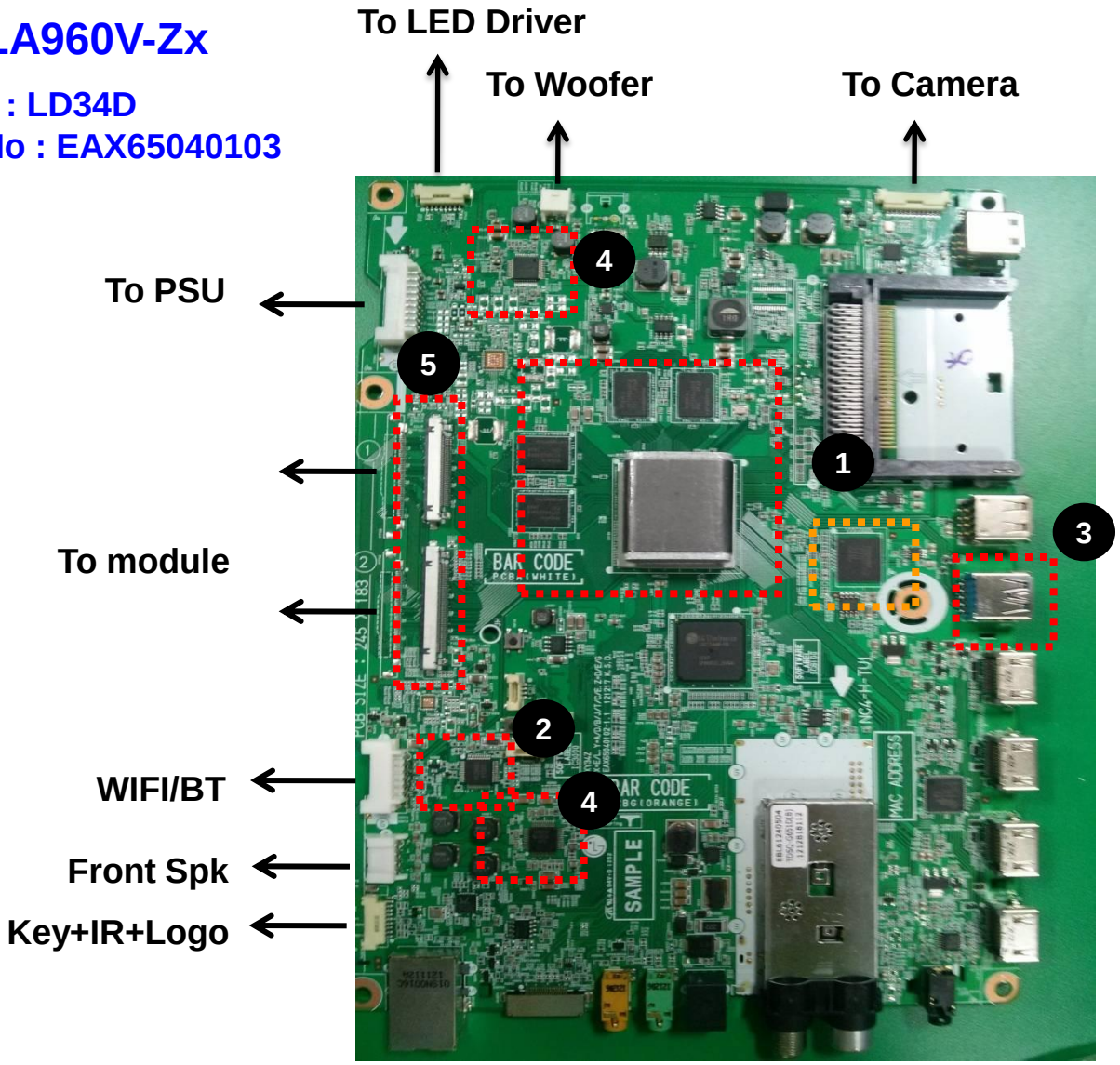
1. Main processor, DDR Memory eMMC Memory
2. Micom for Key/IR/Logo sensing
3. PMIC
4. Audio AMP
5. EPI Wafer
6. Level shifter
7. USB 3.0

Main PCB for Broadband

Main + TCON all in one

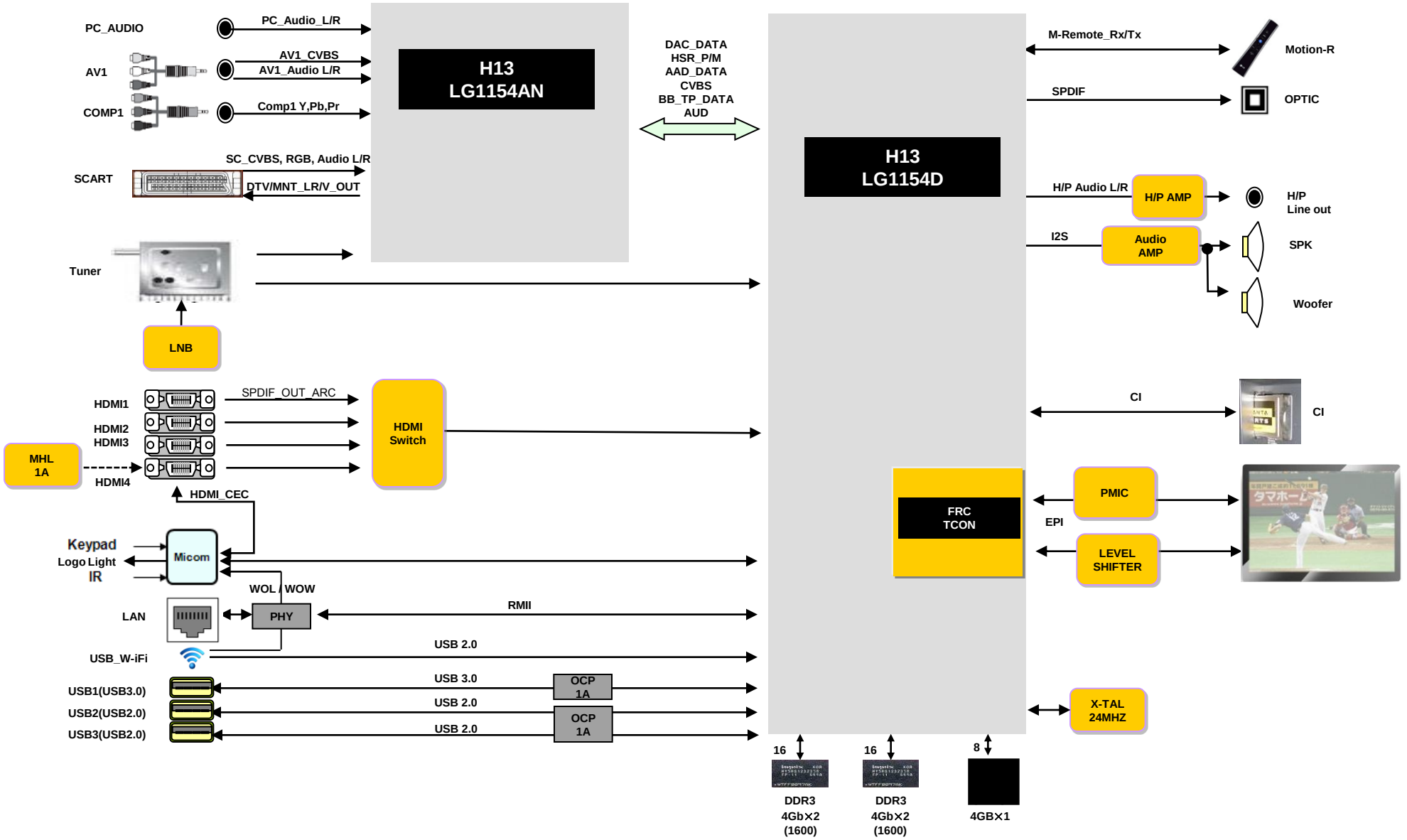
xxLA960V-Zx

Chassis : LD34D
PCB P/No : EAX65040103

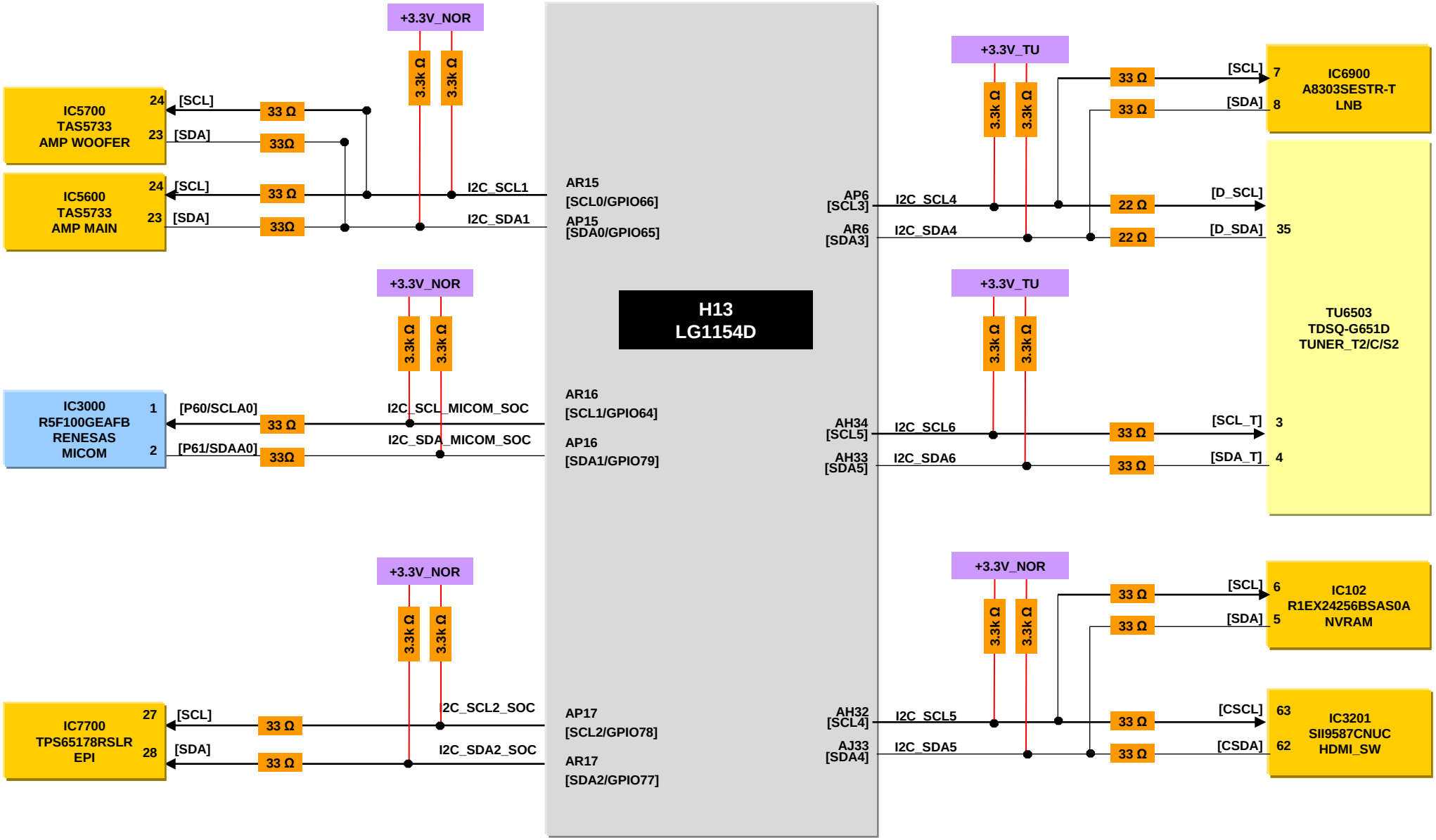


1. Main processor, DDR Memory eMMC Memory
2. Micom for Key/IR/Logo sensing
3. USB 3.0
4. Audio AMP
5. LVDS Wafer

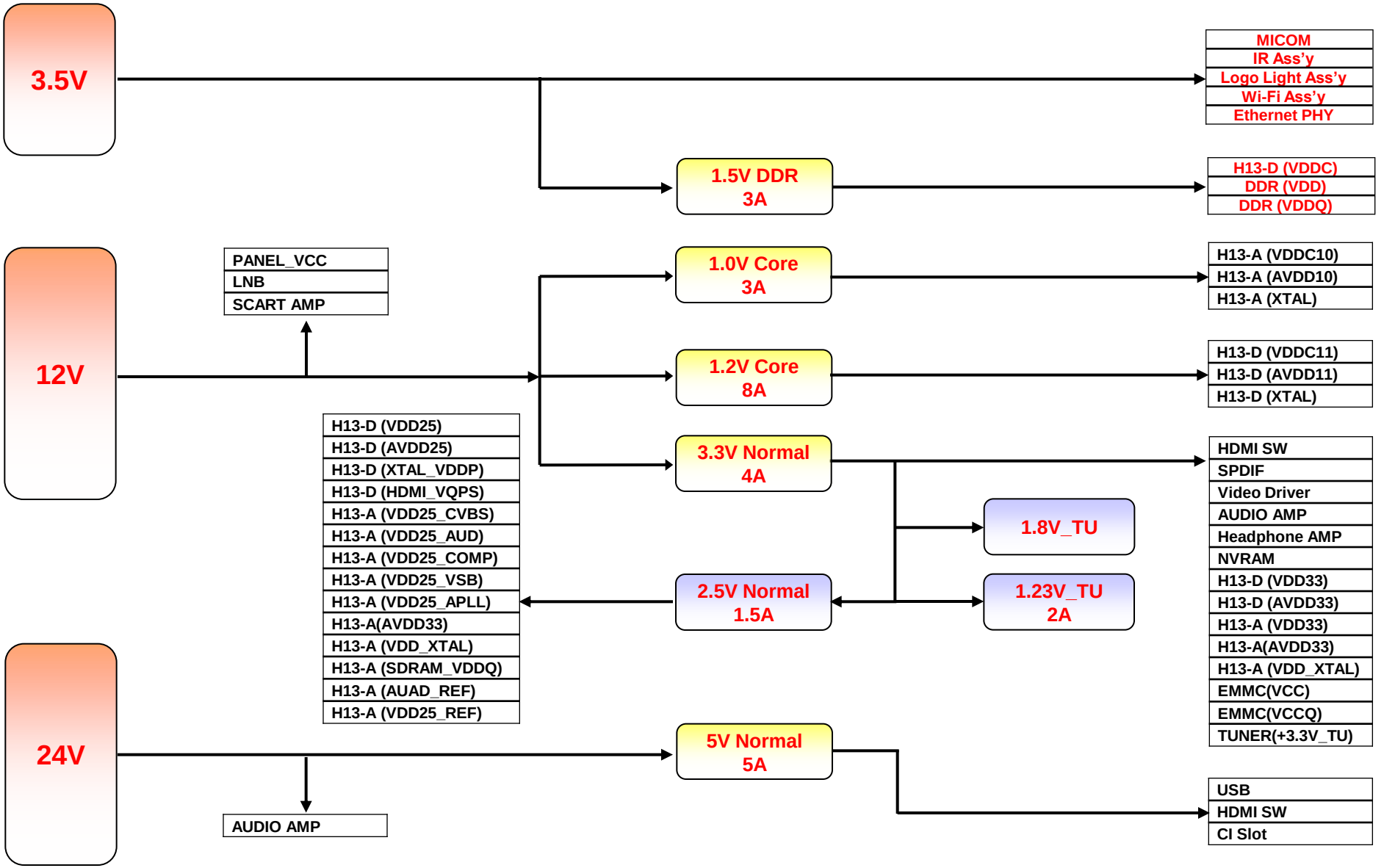
1. H13 Block Diagram (External)



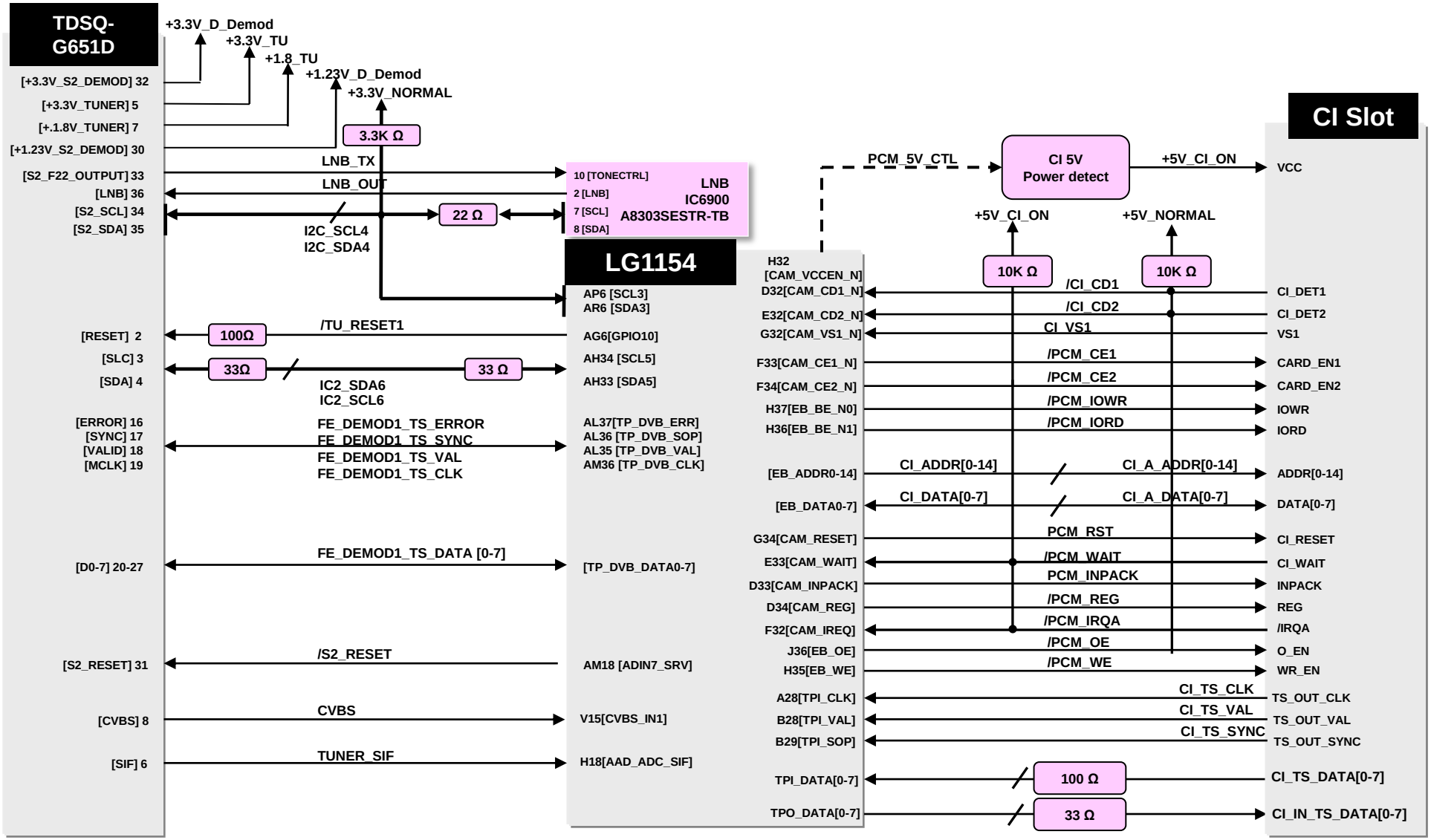
2. LG1154 I2C Map



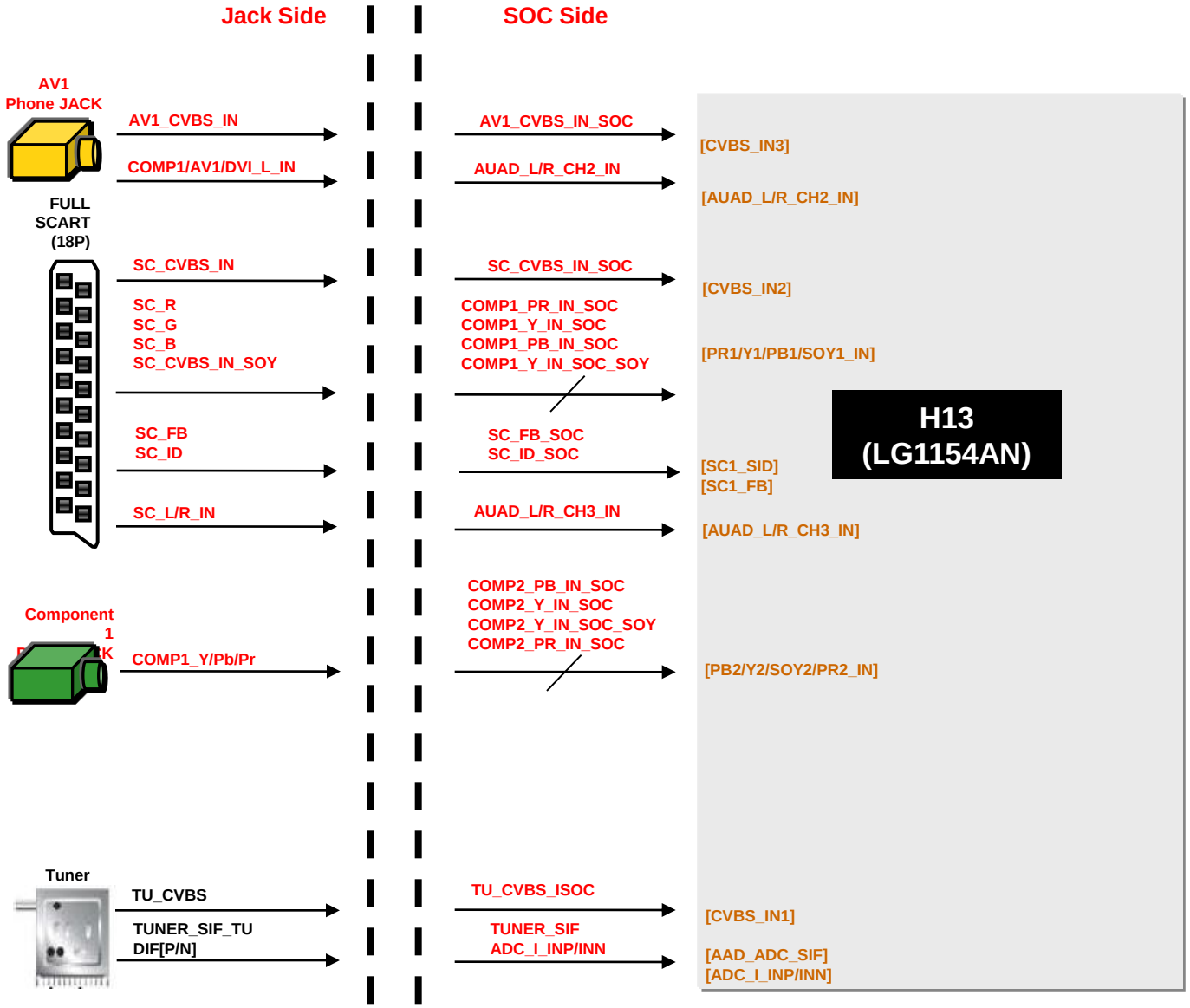
3. Power Block Diagram



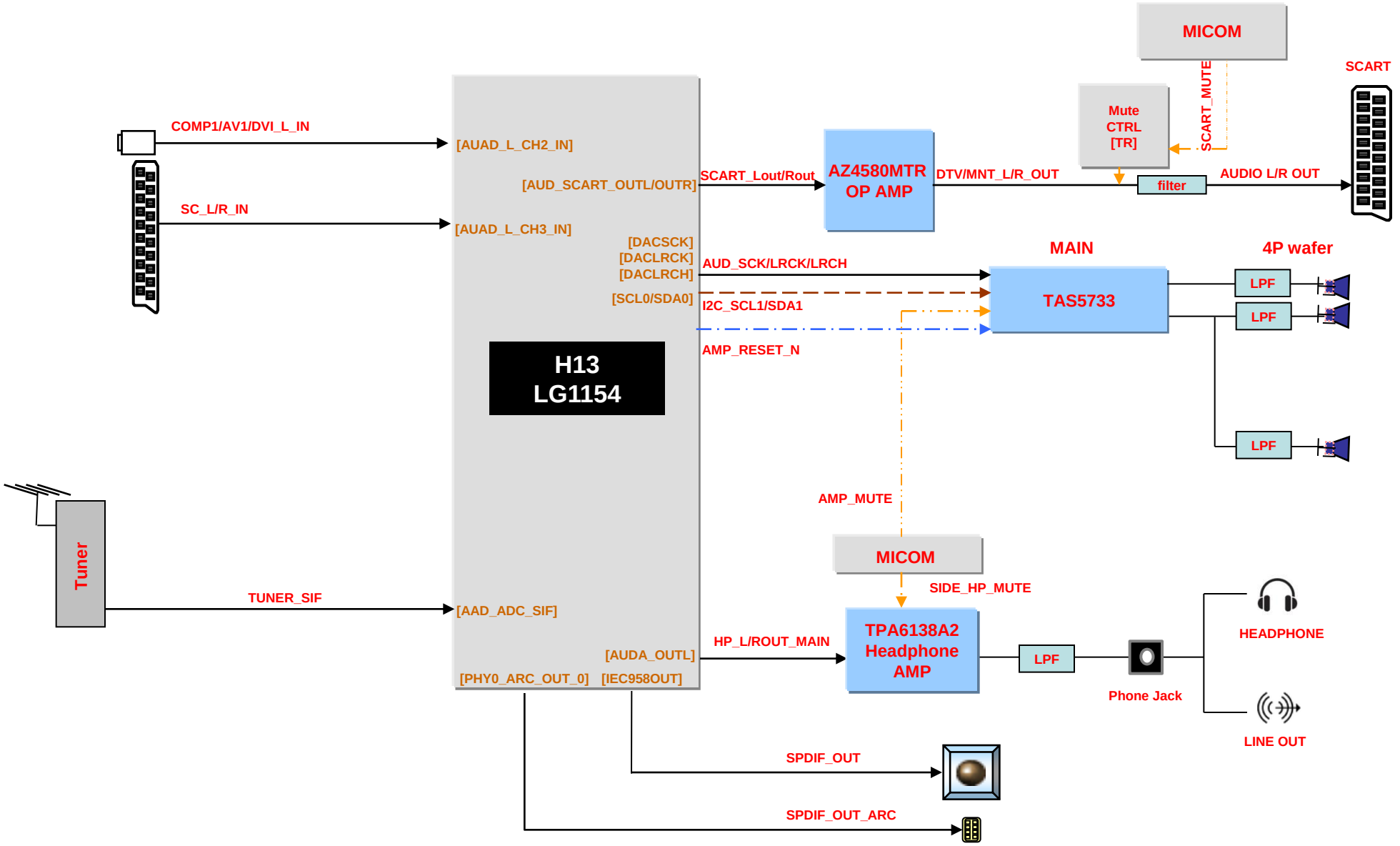
4. Tuner/CI Block Diagram



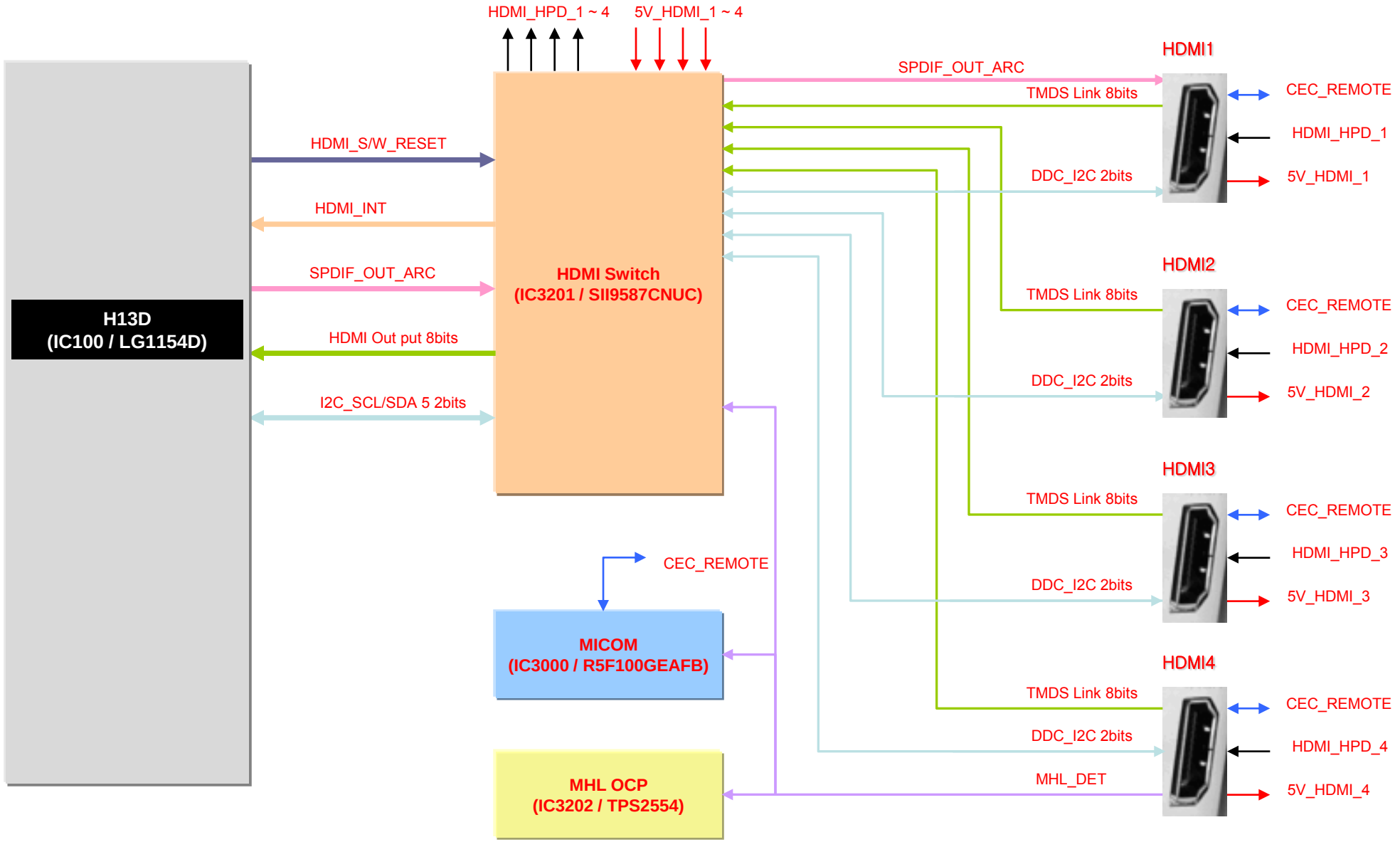
5. Video & Audio IN



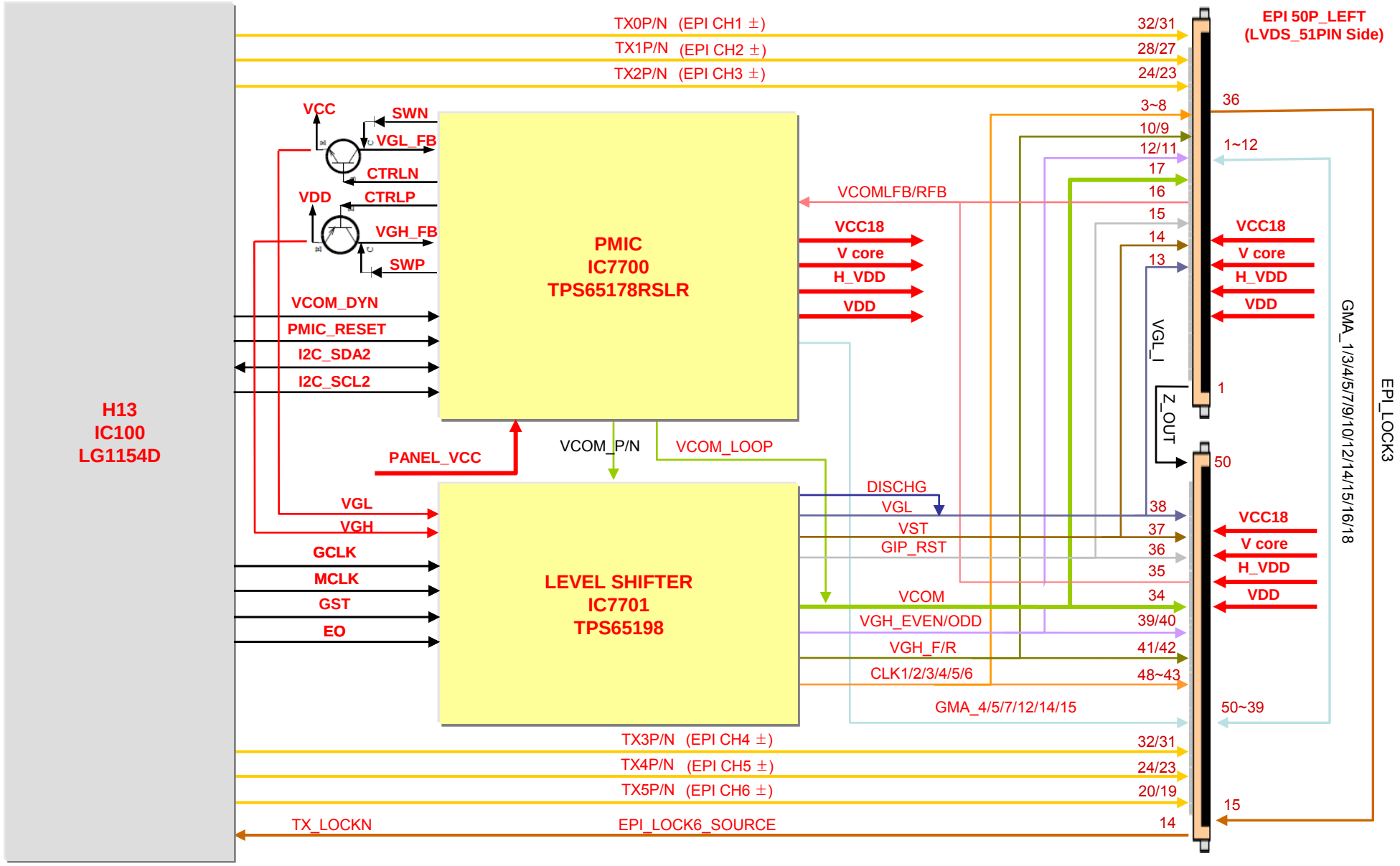
6. AUDIO OUT


MICOM
SCART
SCART_MUTE
Mute CTRL [TR]
COMP1/AV1/DVI_L_IN
[AUAD_L_CH2_IN]
[AUD_SCART_OUTL/OUTR]
SCART_Lout/Rout
AZ4580MTR OP AMP
DTV/MNT_L/R_OUT
filter
AUDIO L/R OUT
SC_L/R_IN
[AUAD_L_CH3_IN]
[DACSCK]
[DACLRCK]
[DACLRCH]
AUD_SCK/LRCK/LRCH
MAIN
4P wafer
TAS5733
LPF
LPF
LPF
[SCL0/SDA0]
I2C_SCL1/SDA1
AMP_RESET_N
H13
LG1154
AMP_MUTE
MICOM
SIDE_HP_MUTE
Tuner
TUNER_SIF
[AAD_ADC_SIF]
[AUDA_OUTL]
HP_L/ROUT_MAIN
TPA6138A2 Headphone AMP
LPF
Phone Jack
HEADPHONE
LINE OUT
[PHY0_ARC_OUT_0]
[IEC958OUT]
SPDIF_OUT
SPDIF_OUT_ARC

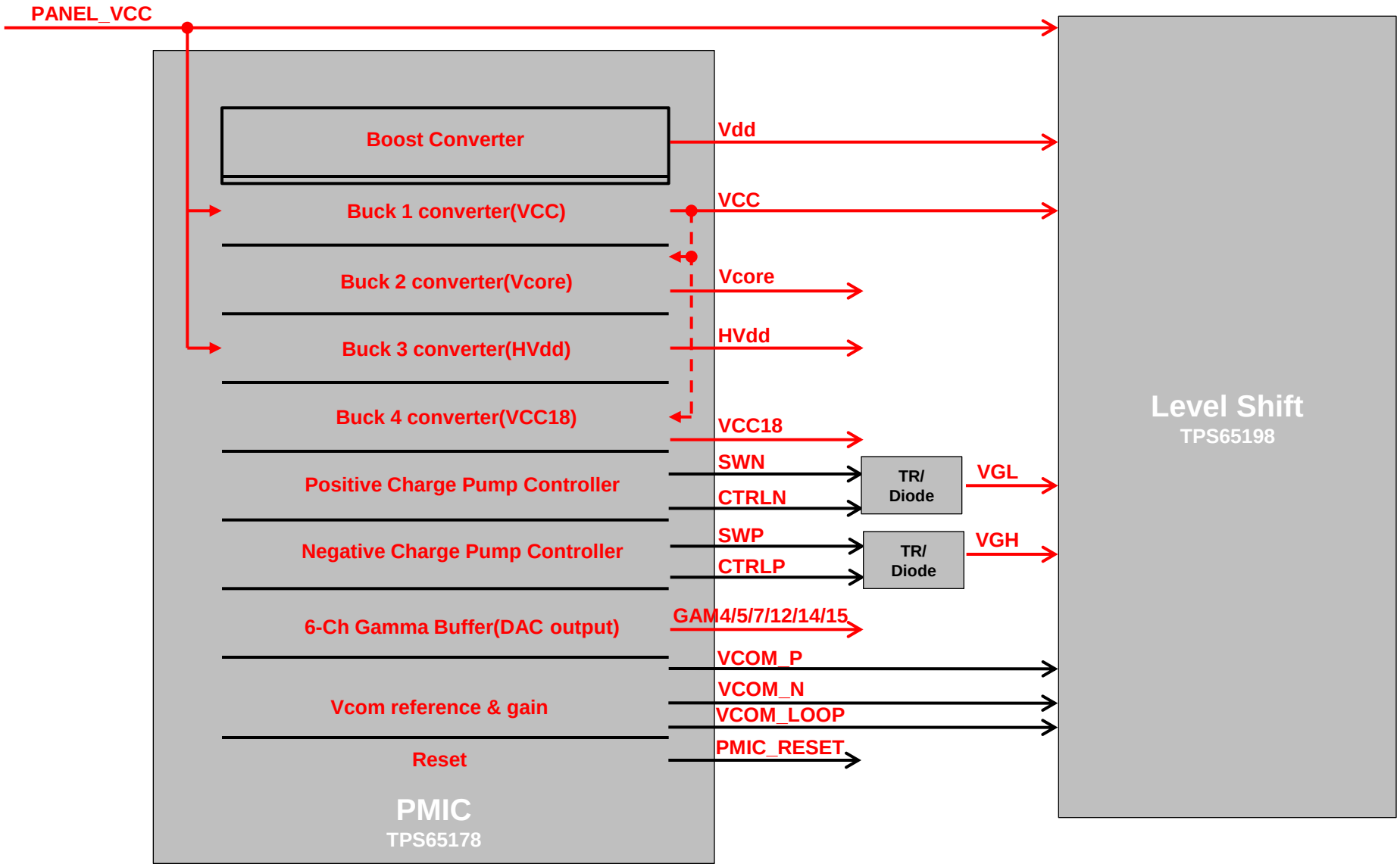
7. HDMI


HDMI_HPD_1 ~ 4
5V_HDMI_1 ~ 4
H13D
(IC100 / LG1154D)
HDMI_S/W_RESET
HDMI_INT
SPDIF_OUT_ARC
HDMI Out put 8bits
I2C_SCL/SDA 5 2bits
HDMI Switch
(IC3201 / SII9587CNUC)
SPDIF_OUT_ARC
TMDS Link 8bits
DDC_I2C 2bits
HDMI1
CEC_REMOTE
HDMI_HPD_1
5V_HDMI_1
HDMI2
TMDS Link 8bits
DDC_I2C 2bits
CEC_REMOTE
HDMI_HPD_2
5V_HDMI_2
HDMI3
TMDS Link 8bits
DDC_I2C 2bits
CEC_REMOTE
HDMI_HPD_3
5V_HDMI_3
HDMI4
TMDS Link 8bits
DDC_I2C 2bits
MHL_DET
CEC_REMOTE
HDMI_HPD_4
5V_HDMI_4
CEC_REMOTE
MICOM
(IC3000 / R5F100GEAFB)
MHL OCP
(IC3202 / TPS2554)

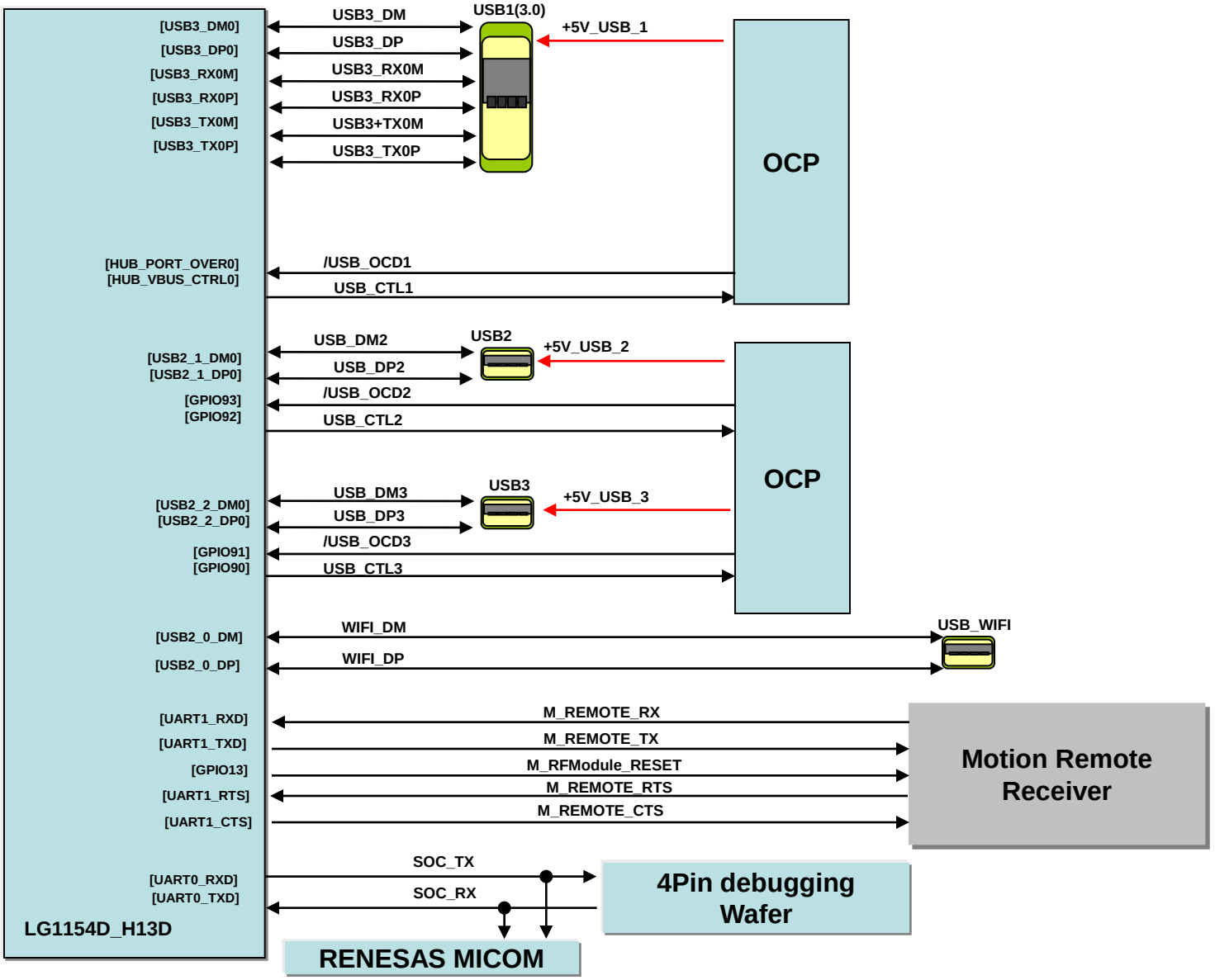
8. Panel Interface Block Diagram



9. PMIC & Level Shift Bloc Diagram

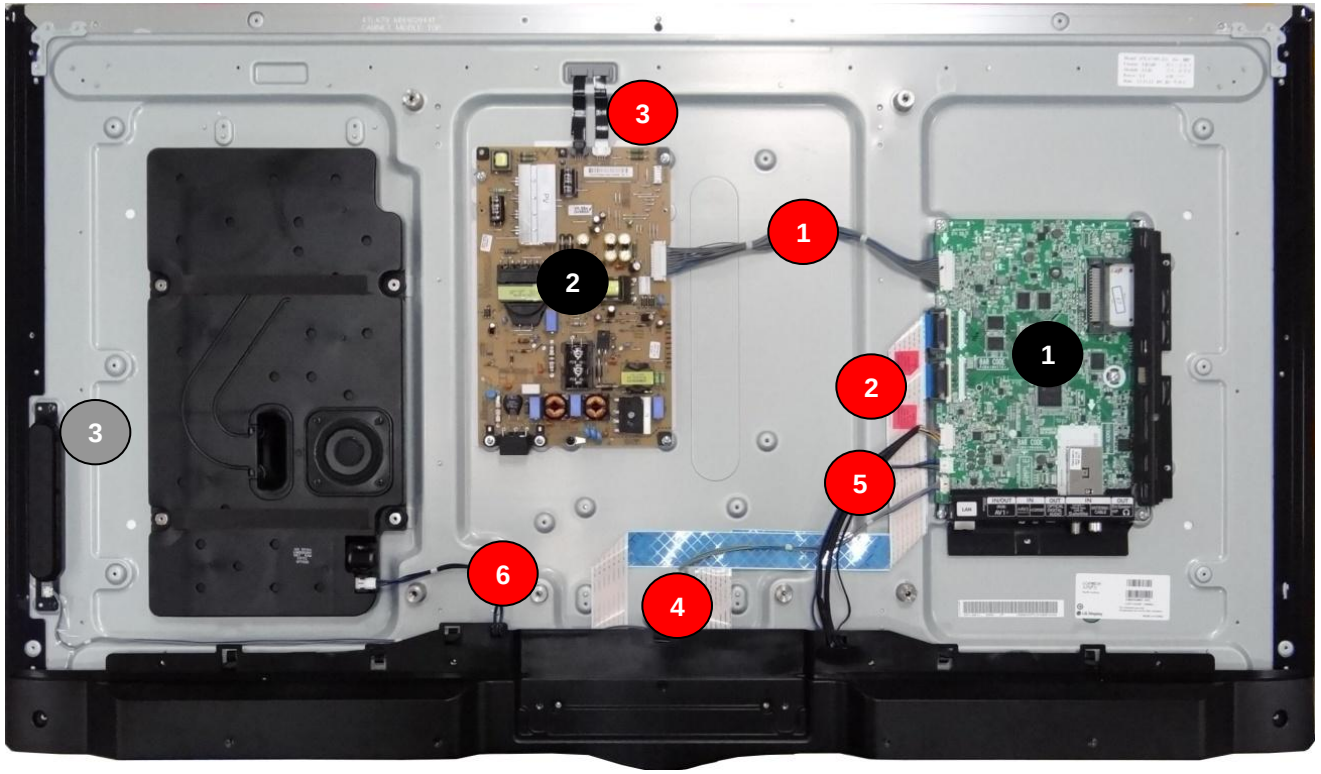


10. USB / WIFI / M-REMOTE / UART



Interconnection - 1

47LA790V-ZA



[PCBs]

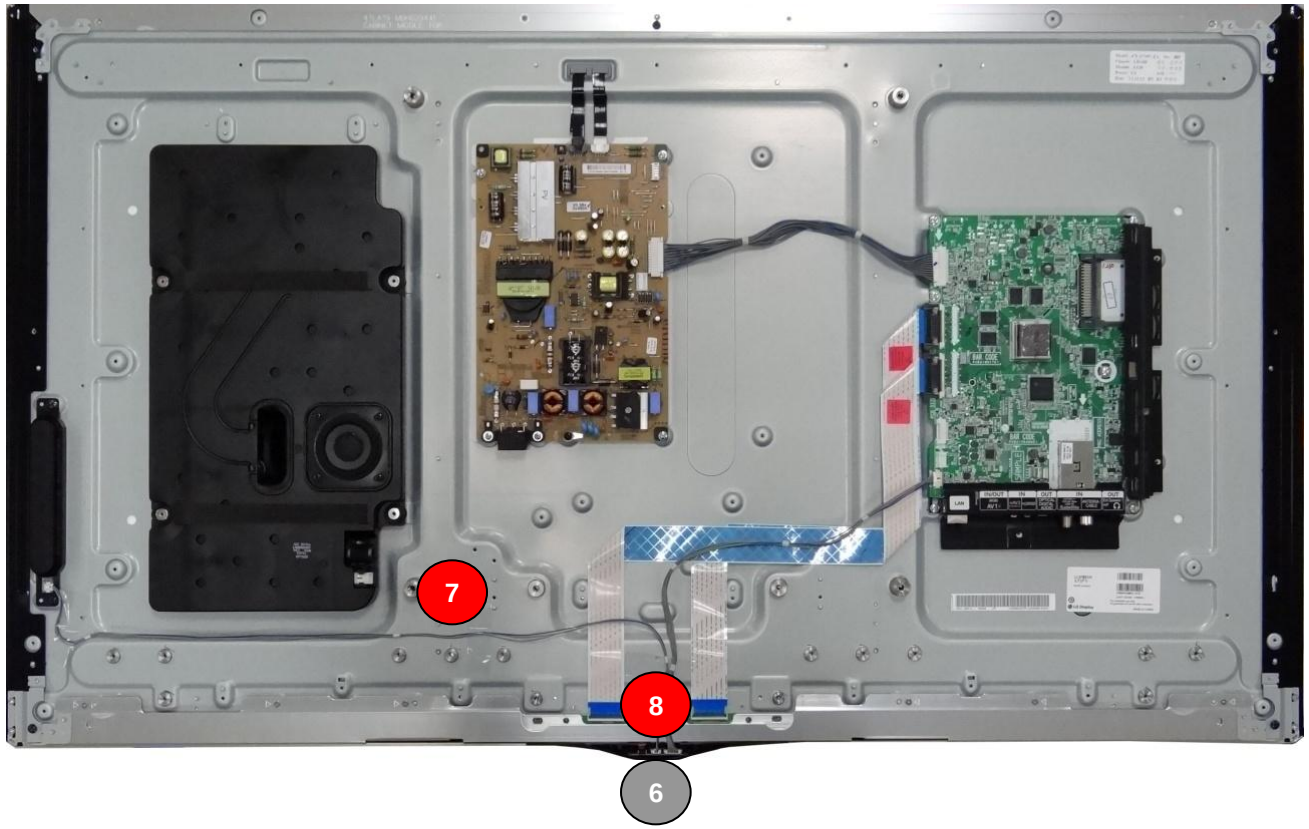
1. Main PCB
2. Power Board
3. Local key Assy
4. RF Assy
5. WIFI Assy

[Cables]

1. Main / LPB 24Pin + Local Dimming Cable
2. Main / Module EPI Cable 50& 50Pin
3. LED driver / PSU
4. IR 8Pin Cable
5. WiFi 6Pin + RF 8Pin Cable
6. SPK Cable

Interconnection - 2

47LA790V-ZA



[PCBs]

6 **IR Assy**

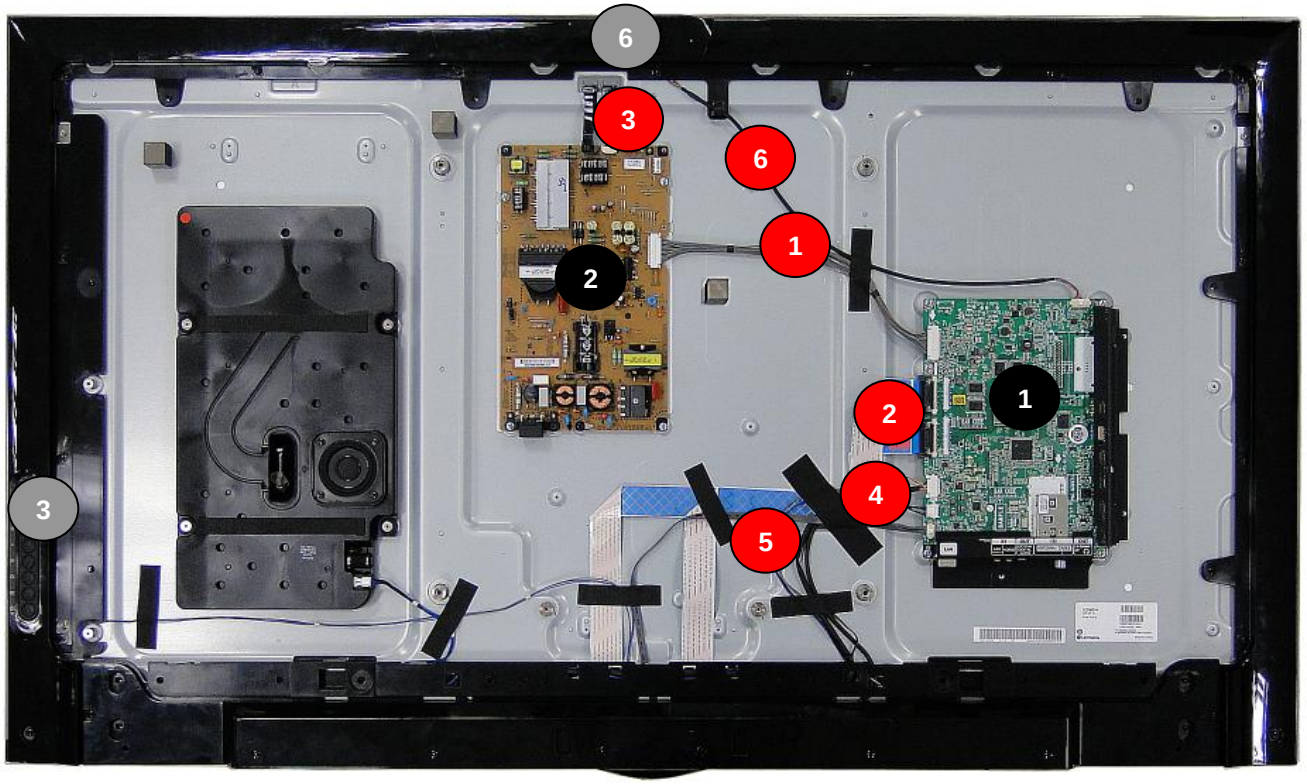
[Cables]

7 **IR to Local Key 3Pin Cable**

8 **IR to Logo Assy 4Pin Cable**

Interconnection - 1

55LA860V-ZA



[PCBs]

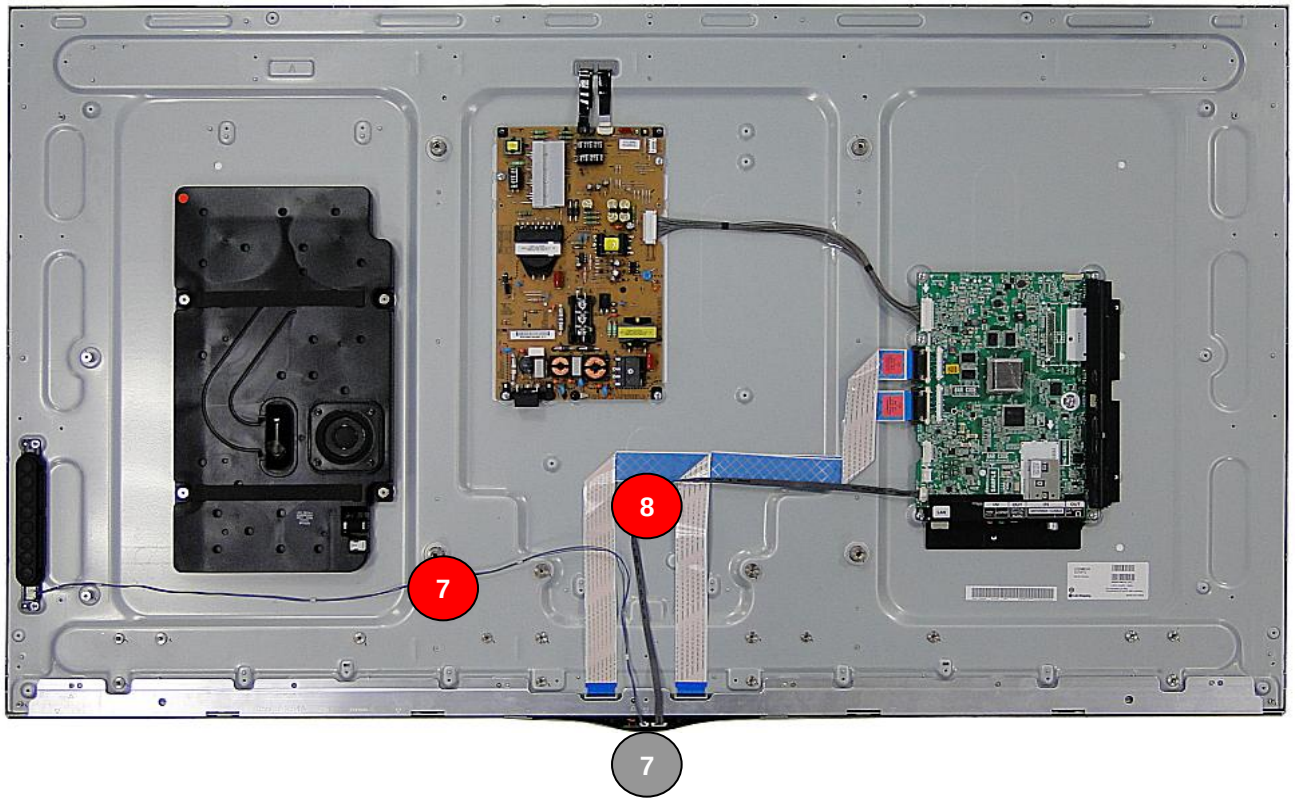
1. Main PCB
2. Power Board
3. Local key Assy
4. RF Assy
5. WIFI Assy
6. Camera Assy

[Cables]

1. Main / LPB 24Pin + Local Dimming Cable
2. Main / Module EPI Cable 50& 50Pin
3. LED driver / PSU
4. WiFi 6Pin + RF 8Pin Cable
5. SPK Cable
6. Camera Cable

Interconnection - 2

55LA860V-ZA



[PCBs]

7 **IR Assy**

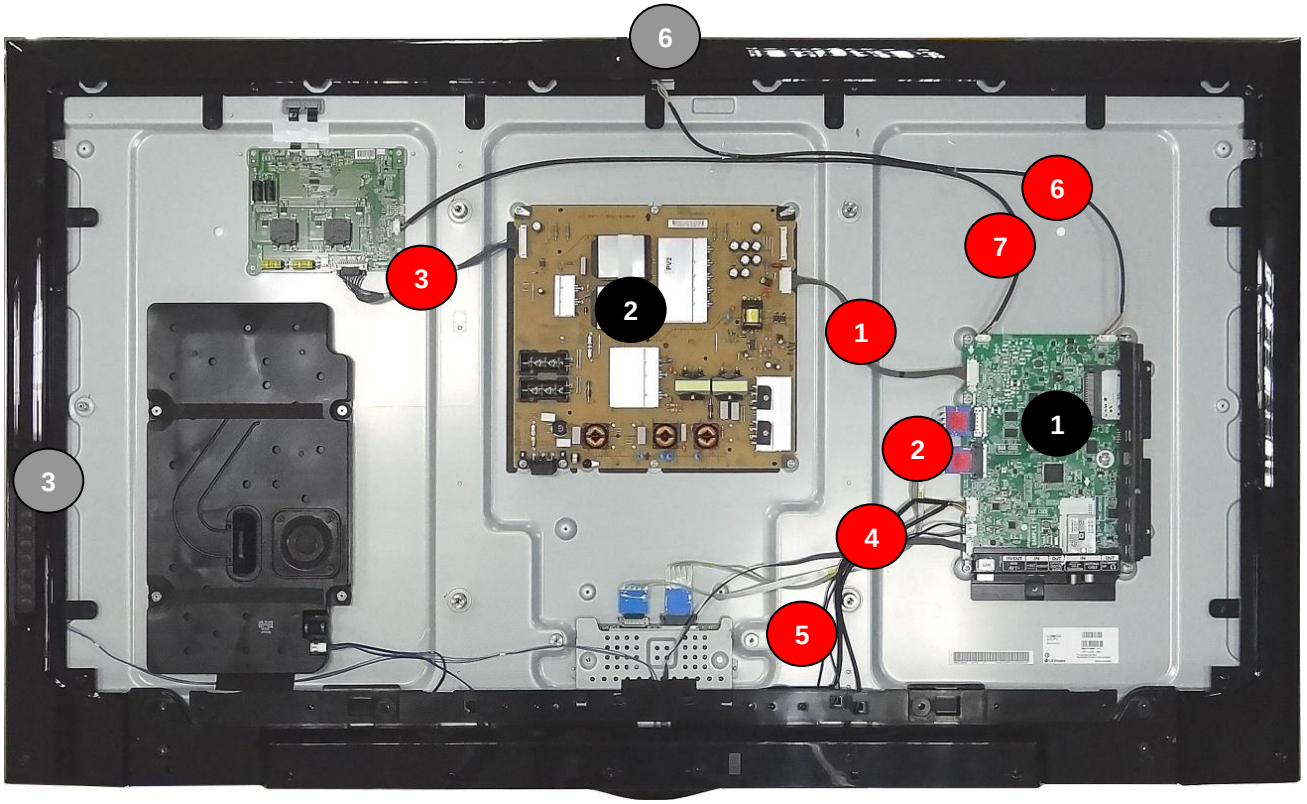
[Cables]

7 **IR to Local Key 3Pin Cable**

8 **IR cable**

Interconnection - 1

60LA860V-ZA



[PCBs]

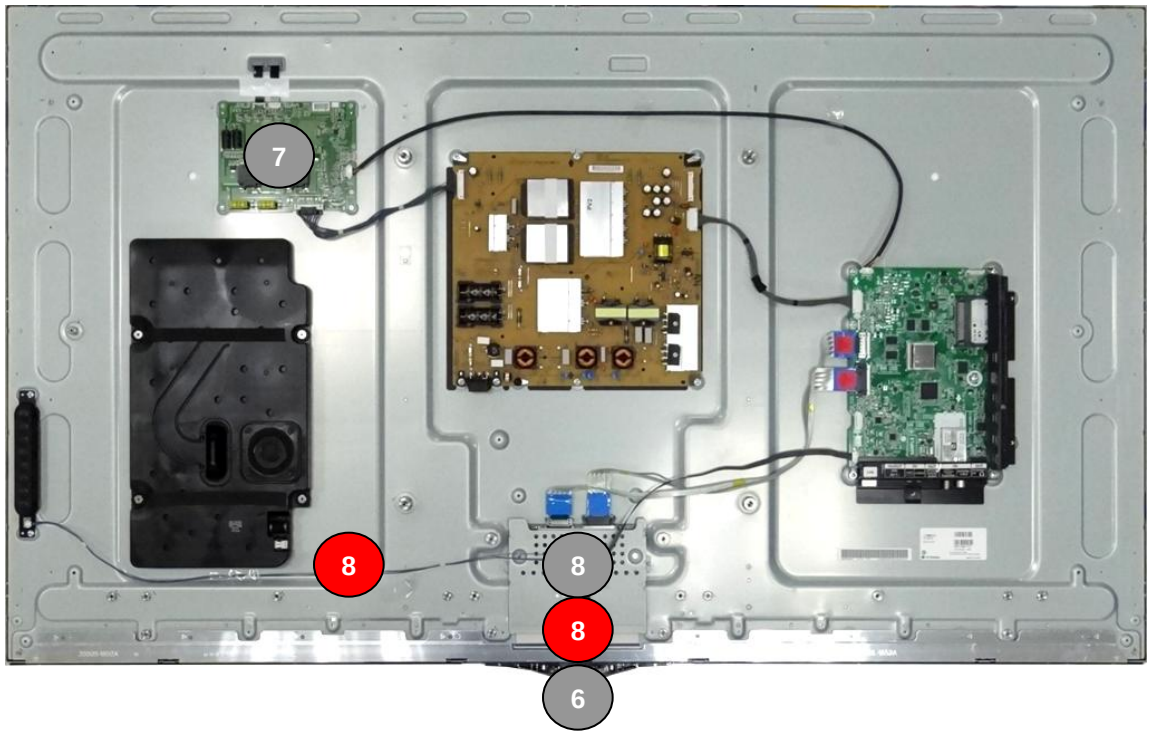
1. Main PCB
2. Power Board
3. Local key Assy
4. RF Assy
5. WIFI Assy
6. Camera Assy

[Cables]

1. Main / PSU 18Pin
2. Main / T-con LVDS Cable 41& 51Pin
3. LED driver 14 Pin cable
4. WiFi 6Pin + RF 8Pin Cable
5. SPK Cable
6. Camera Cable
7. Local Dimming cable

Interconnection - 2

60LA860V-ZA



[PCBs]

6 **IR Assy**

7 **LED Driver**

8 **T-con**

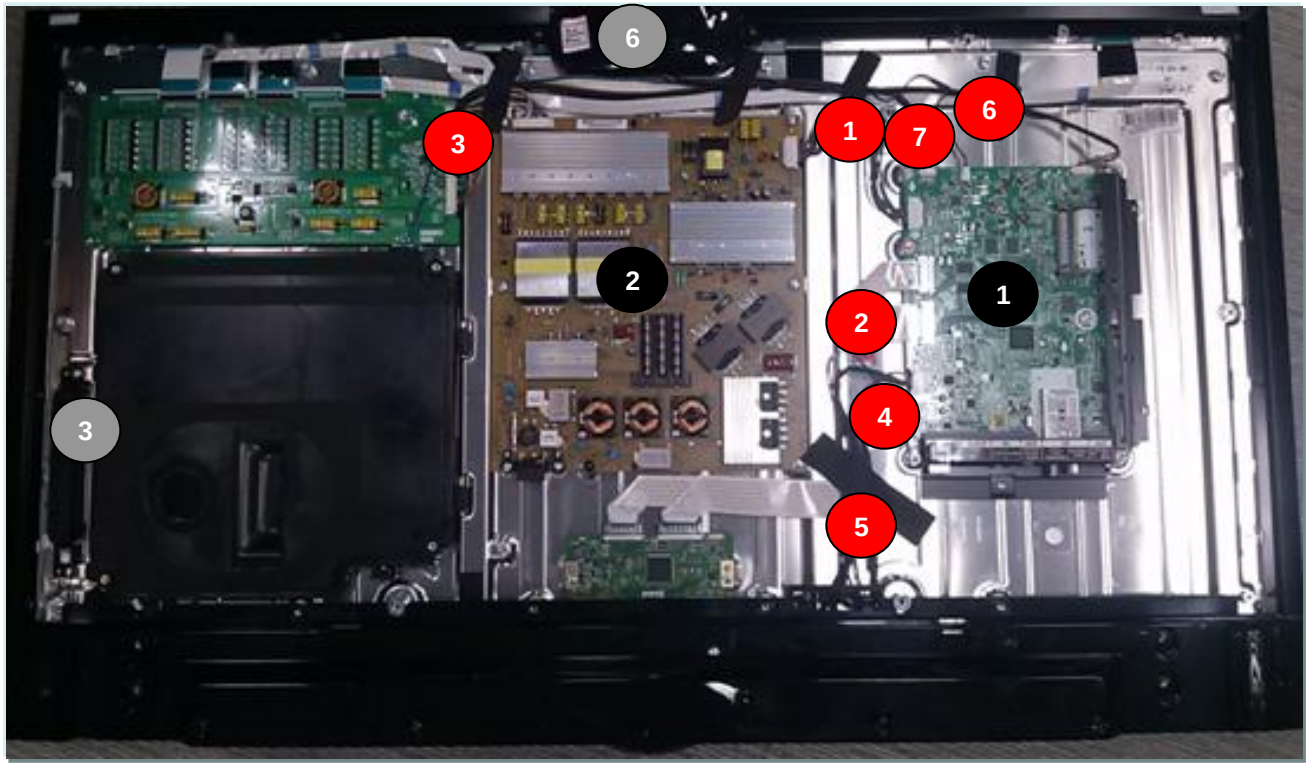
[Cables]

8 **IR to Local Key 3Pin Cable**

9 **IR 8 Pin Cable**

Interconnection - 1

47LA960V-ZA



[PCBs]

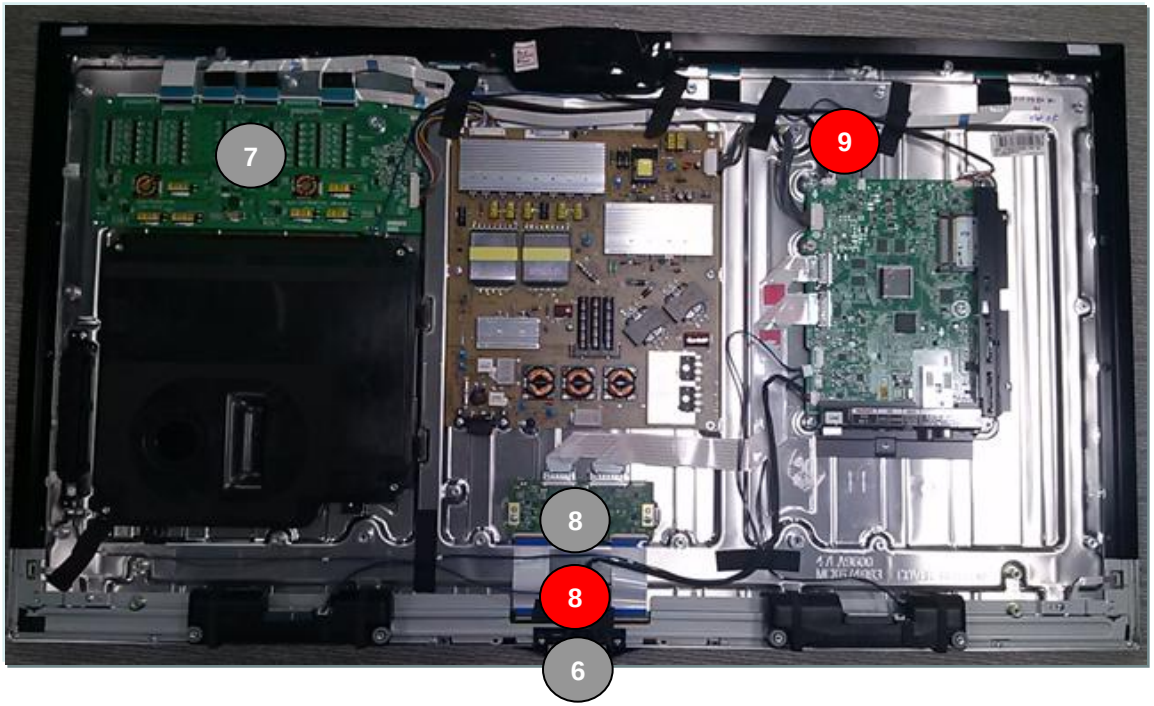
1. Main PCB
2. Power Board
3. Local key Assy
4. RF Assy
5. WIFI Assy
6. Camera Assy

[Cables]

1. Main / PSU 18Pin
2. Main / T-con LVDS Cable 41& 51Pin
3. LED driver 14 Pin Cable
4. WiFi 6Pin + RF 8Pin Cable
5. SPK Cable
6. Camera Cable
7. Local Dimming cable

Interconnection - 2

47LA960V-ZA



[PCBs]

- 6 **IR Assy**
- 7 **LED Driver**
- 8 **T-con**

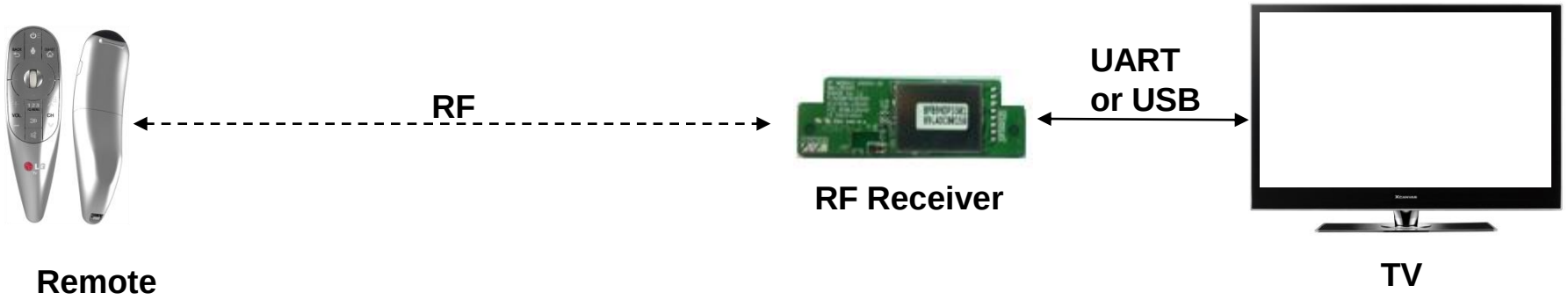
[Cables]

- 8 **IR 5 Pin + Local Key 3 Pin Cable**
- 9 **Woofer Cable**

Introductions of 13Y RF ass'y + Magic Remote control

1. System
2. Remote Buttons
3. MR13 Block Diagram
4. Function List
5. Pairing/Un-pairing Method

1. System



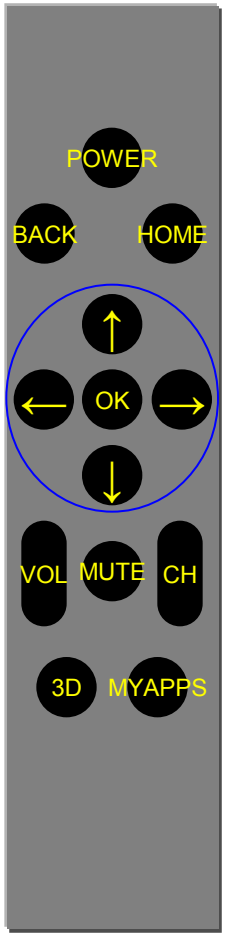
❖ ***Pairing Information Transmission (Send to TV after Paired)***
- Static Calibration Data (Bypass only)
- Remote FW ver. (Save also in Receiver)
- BD_ADDR (Save also in Receiver)

• ***Pairing Information Transmission Sequence***
- When it is paired, the remote sends packets(pairing success, F/W version, BD_ADDR) to the receiver.
- The receiver sends the pairing success packet to TV directly.
- F/W version and BD_ADDR packets are just saved on the receiver.
- The receiver sends F/W version or BD_ADDR packet to TV when it is required.

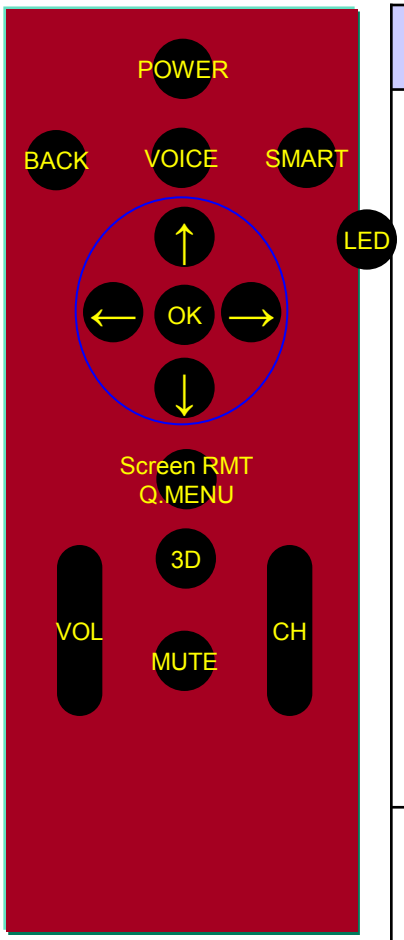
❖ ***Motion Data Transmission***
- Period : 7.5msec
- Motion Data : gyro, accelerometer

❖ ***Voice Data Transmission***
- Period : 10msec
- Voice sampling : 16khz 16bit

2. Remote Buttons (M4 vs. MR13P)



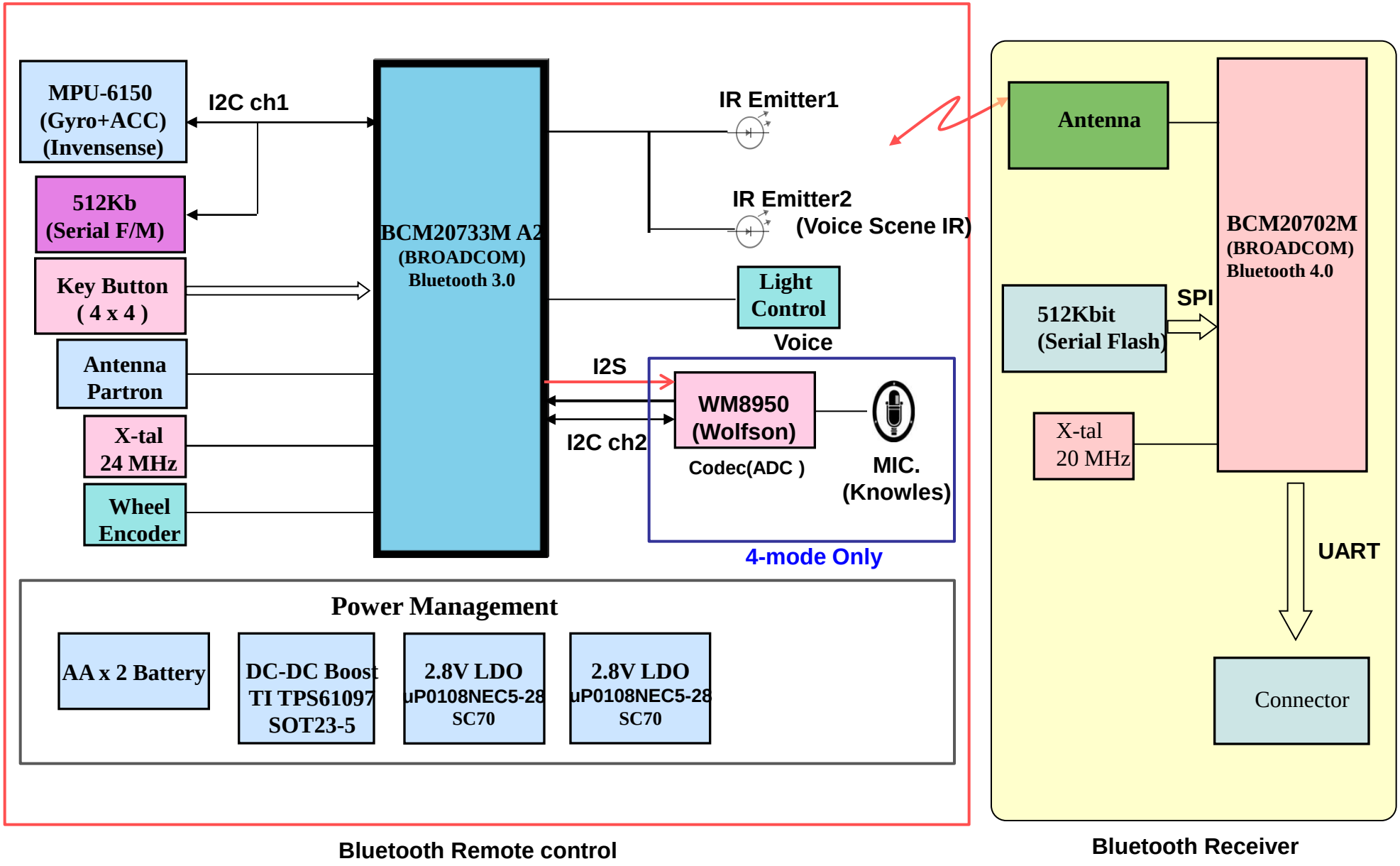
M4 Remote



MR13P Remote

BUTTON		RF Unpaired IR_CODE	RF Paired RF_CODE	IR continuous repeat	ETC.
Phsical Buttons	POWER	0x08	NONE	**Y**	IR only
	BACK	0x28	0x8028	**Y**	
	SMART	0x7C	0x807C	**Y**	
	←	0x07	0x8007	**Y**	
	→	0x06	0x8006	**Y**	
	↑	0x40	0x8040	**Y**	
	↓	0x41	0x8041	**Y**	
	OK	0x75	0x8044	**Y**	
	VOICE	0xDE	0x808B	**Y**	= VOICE_START
	3D	0xDC	0x80DC	**Y**	
	Screen RMT / Q.MENU	0xDE	0x80DE	**Y**	
	CH +	0x00	0x8000	**Y**	
	CH -	0x01	0x8001	**Y**	
	VOL +	0x02	0x8002	**Y**	
	VOL -	0x03	0x8003	**Y**	
	MUTE	0x09	0x8009	**Y**	
Logical Buttons	AUTO_WAKEUP	X	0x800C		
	VOICE_START	X	0x800A		
	VOICE_STOP	X	0x800D		
	POINT_START	X	0x803E		
	POINT_STOP	X	0x803F		

3. MR13P Block Diagram



4. Function list

주요 Item			IC	Manufacturer	Function
Remocon	Voice	Voice Codec	WM8950	Wolfson	16KHz Sampling of Audio data
		MEMS Mic.	SPU0414HR5H	Knowles	Sensing Voice
	Motion Sensor	Gyro Sensor + Accelerometer	MPU-6150	Invensense	Sensing angular velocity of X, Y, Z-axis
					Sensing device tilt (Pitch & Roll angle)
	RF + Micom	RF Antenna	SDBTPTR3015	Partron	Wireless communication
		X-tal	24MHz	Partron	
		RF + Micom	BCM20733A2	Broadcom	
	DC-DC Converter		TPS61097	TI	Battery Boost up Regulator
	LDO1		uP0108NEC5-28	uPI	RF, Gyro, Accelerometer Power Supply
	LDO2		uP0108NEC5-28	uPI	Audio Codec, Mic. Power Supply

5. RF Pairing / Un-pairing Method

	Method	Description
RF Pairing	❖ Method1 – If unpaired, just press "OK" button. – If paired, press "OK" button after unpairing. ❖ Method 2 (Repairing) – Press “BACK" button for 5 sec.	• When do pairing, the remote should make pairing request IR signal(0x75) to TV. • When TV receive the IR signal, it should send "pairing request packet" to the RF receiver. • After pairing success, the remote should blink LED for some time and TV send "pairing success packet" back to TV. • When remote try to unpairing, it doesn’t care about state of receiver(stand alone).
RF Unpairing	Press “BACK" button and “SMART" button at the same time for 5 sec.	• When remote try to unpairing, it doesn’t care about state of receiver(stand alone). • After unpairing, all pairing information should be erased. • After unpairing, LED should be blinked for 3sec. • The remote just becomes to IR mode.

Introductions of 13Y WIFI built in ass'y

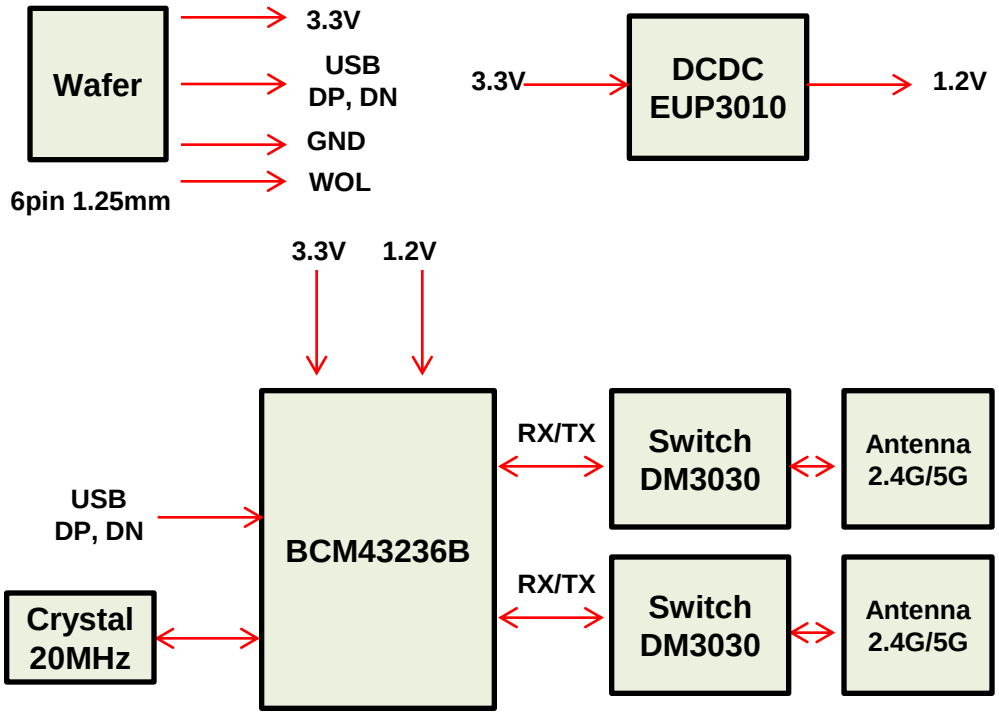
1. Wi-Fi built in Ass'y feature
2. Wi-Fi built in Ass'y specification

WIFI Built in ass'y feature

Block diagram

30

48



- Pin map

PIN	USB interface
1	Vcc
2	DM
3	DP
4	GND
5	WOW
6	NC

WIFI Built in ass'y Specification

- Frequency Band:
  - Draft 802.11n Radio: 2.4 GHz
  - 802.11g Radio: 2.4 GHz
  - 802.11b Radio: 2.4 GHz

USA – FCC	2412~2462MHz (Ch1~Ch11)
Canada – IC	2412~2462MHz (Ch1~Ch11)
Europe – ETSI	2412~2472MHz (Ch1~Ch13)
Japan – STD-T66/STD-33	2412~2484MHz (Ch1~Ch14)

802.11a Radio : 5 GHz

5.150~5.250GHz

5.725~5.850GHz

- Operating Channels:

IEEE 802.11b/g/n compliant:

11 channels (US, Canada)

13 channels (ETSI)

14 channels (Japan)

- Transmit Power and Sensitivity:

TX Output Power:(Typical) (Meet emission standard)

11b	17	+/- 2 dBm
11g	14	+/- 2 dBm@54Mbps (Each chain)
11n	13	+/- 2 dBm (Each chain)

Rx Sensitivity:(Typical)

-69dBm at HT20 m7 2.4GHz

-87dBm at HT20 m0 2.4GHz

-69dBm at HT20 m7 5.0GHz

-87dBm at HT20 m0 5.0GHz

- Modulation

DBPSK @1Mbps

DQPSK@2Mbp

CCK@5.5/11Mbps

BPSK@6/9 Mbps

QPSK@12/18Mbps

16-QAM@24Mbps

64-QAM@48/54Mpb and above

- Current consumption(5V DC):

Full load: 430mA

- Operating Temperature: 0 ~ 60 °C ambient
- Storage Temperature: -20 ~ 60 °C ambient
- Humidity: under 85% and must be non-condensing

- Regulation and certification compliance available:
  - CE
  - FCC
  - WiFi

  - WPS

Contents of LCD TV Standard Repair Process

No.	Error symptom (High category)	Error symptom (Mid category)	Page	Remarks
1	A. Video error	No video/Normal audio	1	
2		No video/No audio	2	
3		Video error, video lag/stop, fail tunning	3, 4	
4		Color error	5	
5		Vertical/Horizontal bar, residual image, light spot, external device color error	6	
6	B. Power error	No power	7	
7		Off when on, off while viewing, power auto on/off	8	
8	C. Audio error	No audio/Normal video	9	
9		Wrecked audio/discontinuation/noise	10	
10	D. Function error	No response in remote controller, key error, recording error, memory error	11	
11		External device recognition error	12	
12	E. Noise	Circuit noise, mechanical noise	13	
13	F. Exterior error	Exterior defect	14	
14	G. Network error	Connection defect / Network speed low	15	

First of all, Check whether there is SVC Bulletin in GCSC System for these model.

Contents of LCD TV Standard Repair Process Detail Technical Manual

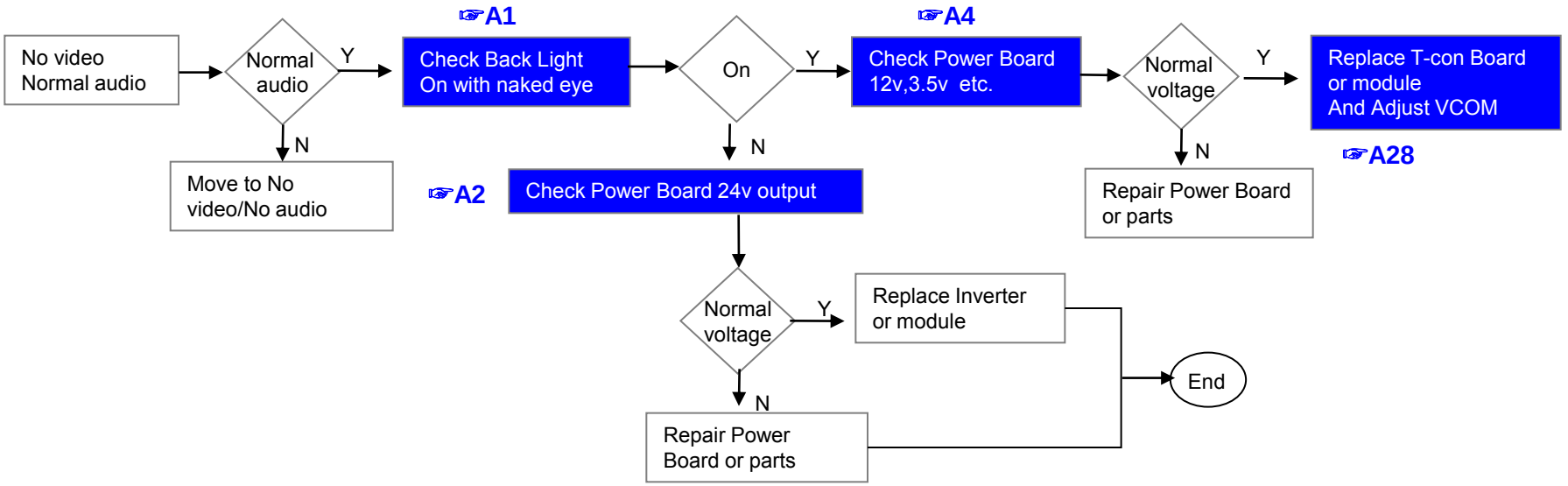
No.	Error symptom	Content	Page	Remarks
1	A. Video error_ No video/Normal audio	Check LCD back light with naked eye	A1	
2		LED driver B+ 24V measuring method	A2	
3		Check White Balance value	A3	
4		Power Board voltage measuring method	A4	
6	A. Video error_ No video/Video lag/stop	TUNER input signal strength checking method	A6	
7		LCD-TV Version checking method	A7	
9	A. Video error_Color error	LCD TV connection diagram	A8	
10		Tuner Checking Part	A9	
11		Check Link Cable (LVDS) reconnection condition	A10 A11	A10 : 32/37/42/47/55 A11 : 32 AUO
12		Adjustment Test pattern - ADJ Key	A12	
13	A. Video error_Vertical/Horizontal bar, residual image, light spot	LCD TV connection diagram	A8	
14		Check Link Cable (LVDS) reconnection condition	A10 A11	A10 : 32/37/42/47/55 A11 : 32 AUO
15		Adjustment Test pattern - ADJ Key	A12	
16	<Appendix> Defected Type caused by T-Con/ Inverter/ Module	Exchange T-Con Board (1)	A-1/5	
17		Exchange T-Con Board (2)	A-2/5	
18		Exchange LED driver Board (PSU)	A-3/5	55" : driver board Other : PSU
19		Exchange Module itself (1)	A-4/5	
20		Exchange Module itself (2)	A-5/5	

Continue to the next page

Standard Repair Process

LCD TV	Error symptom	A. Video error	Established date	2012. 12 .06	
		No video/ Normal audio	Revised date		

First of all, Check whether all of cables between board is inserted properly or not.
(Main B/D↔ Power B/D, LVDS Cable,Speaker Cable,IR B/D Cable,,,)

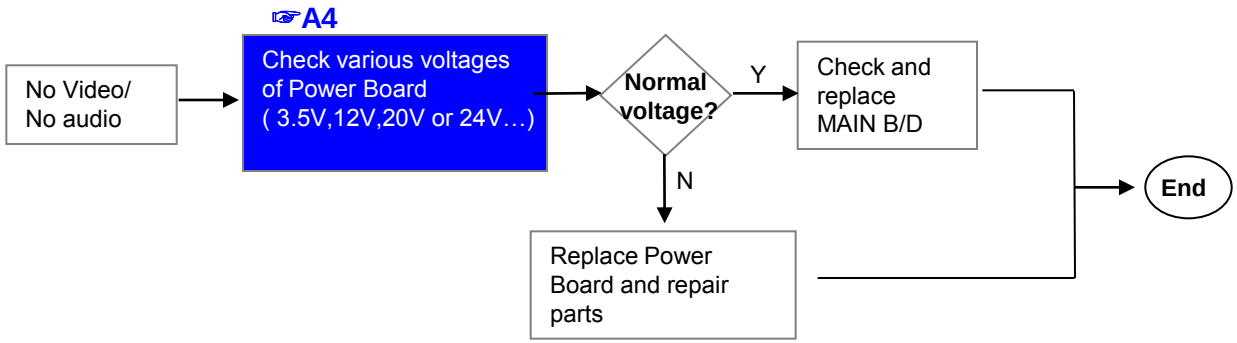


※Precaution ☞A7 & A3

Always check & record S/W Version and White Balance value before replacing the Main Board → Replace Main Board → Re-enter White Balance value

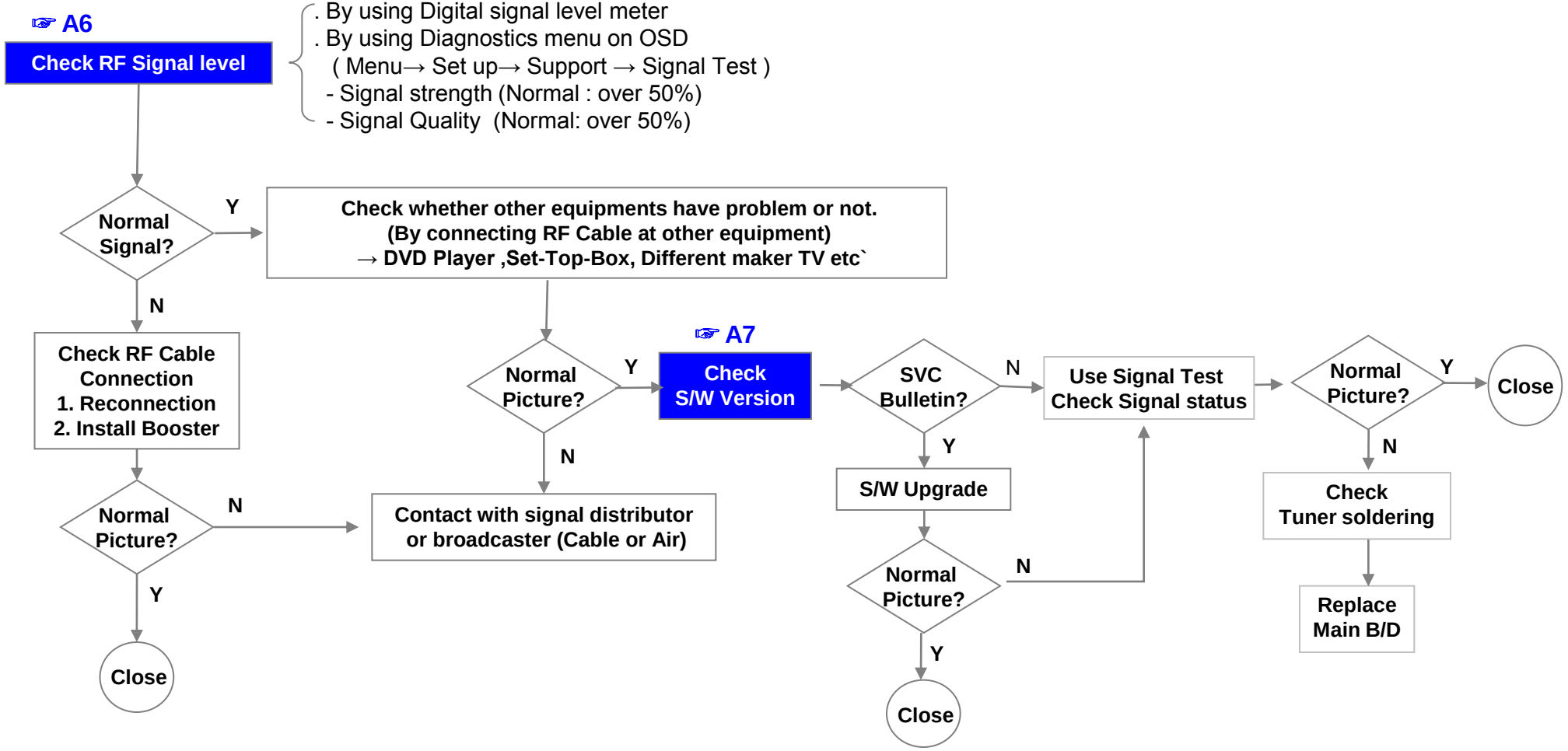
Standard Repair Process

LCD TV	Error symptom	A. Video error	Established date	2012. 12 .06	
		No video/ No audio	Revised date		



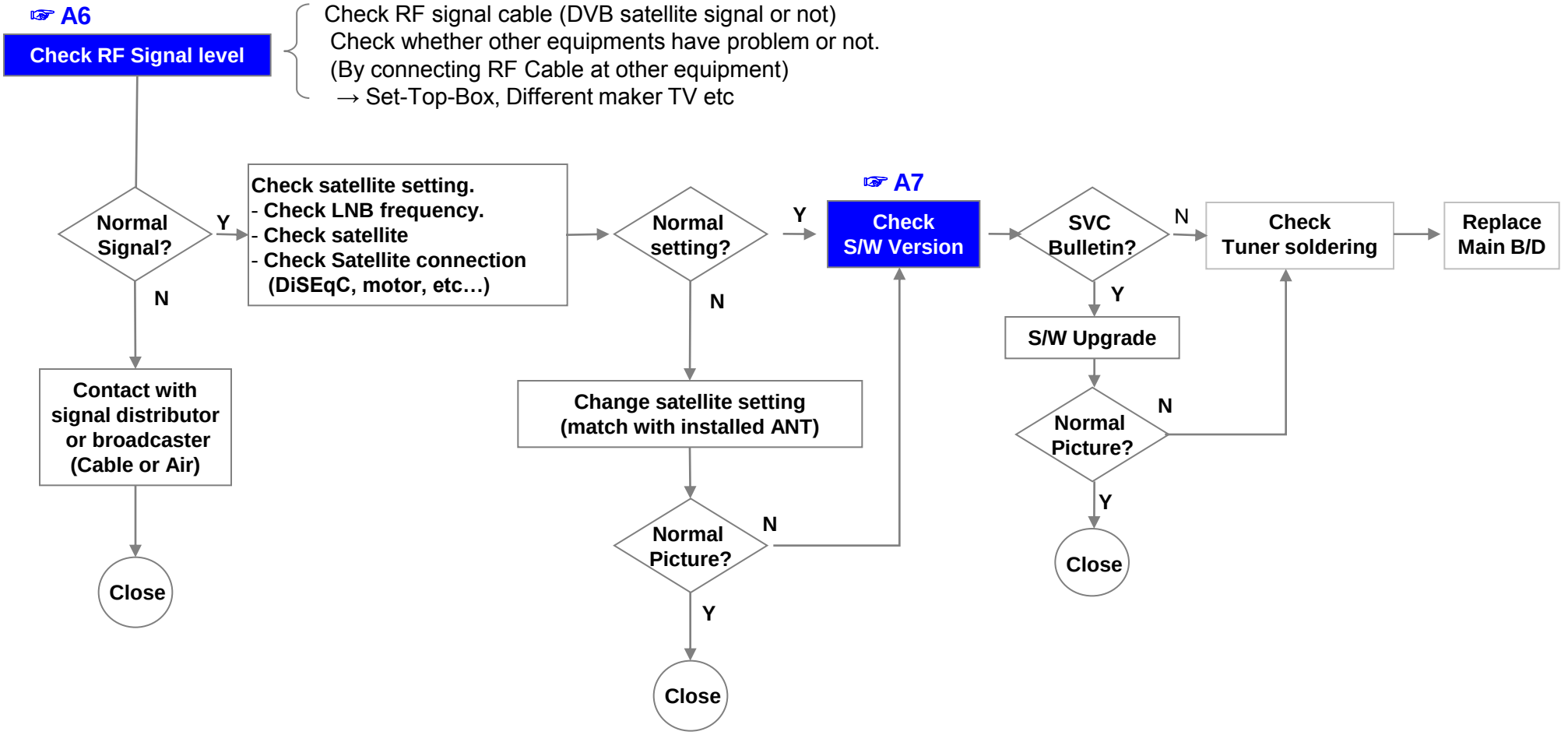
Standard Repair Process

LCD TV	Error symptom	A. Picture Problem	Established date	2012. 12 .06	
		Picture broken/ Freezing	Revised date		



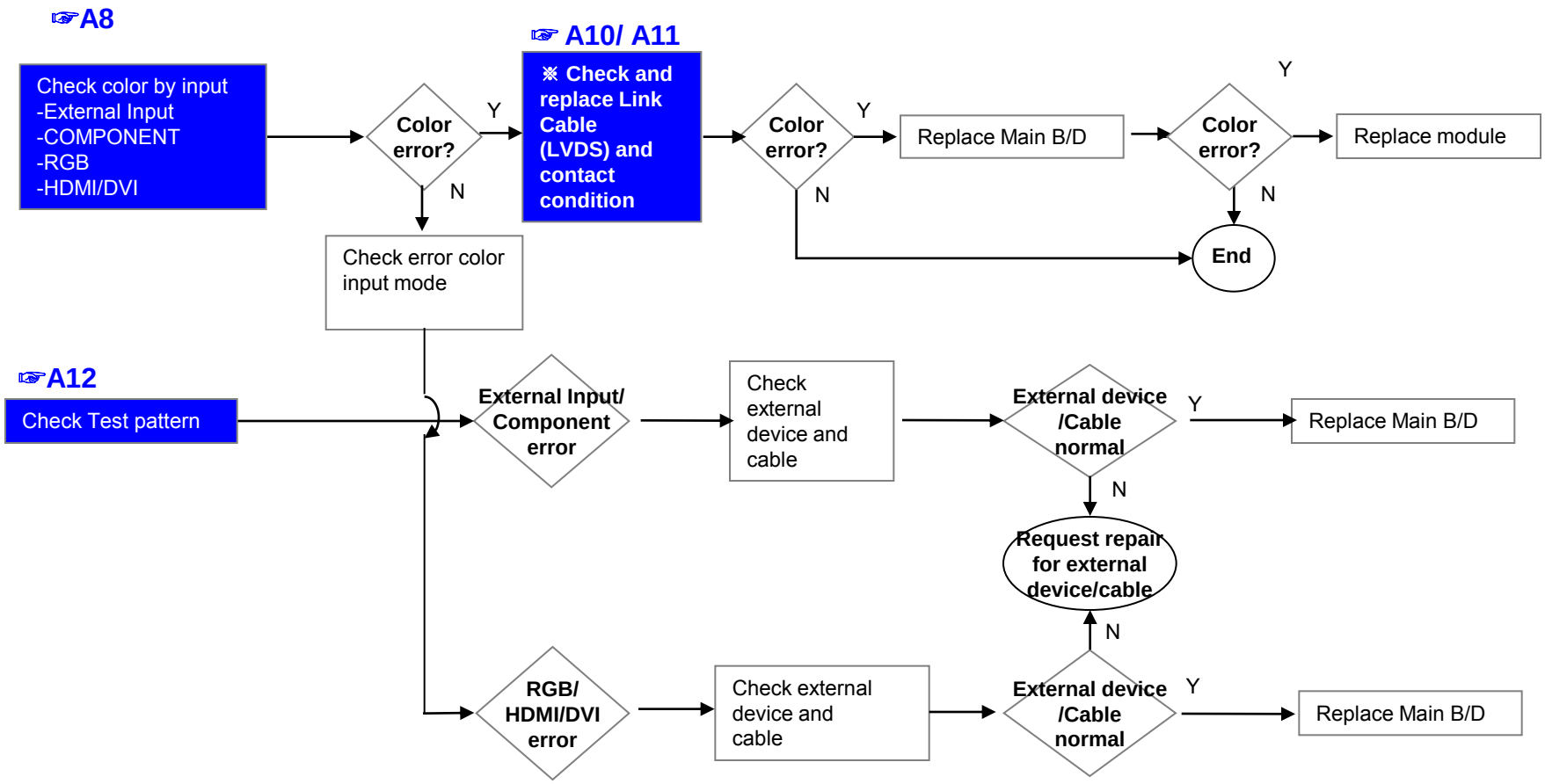
Standard Repair Process

LCD TV	Error symptom	A. Picture Problem (DVB-S/S2)	Established date	2012. 12 .06	
		Tuning fail, Picture broken/ Freezing	Revised date		



Standard Repair Process

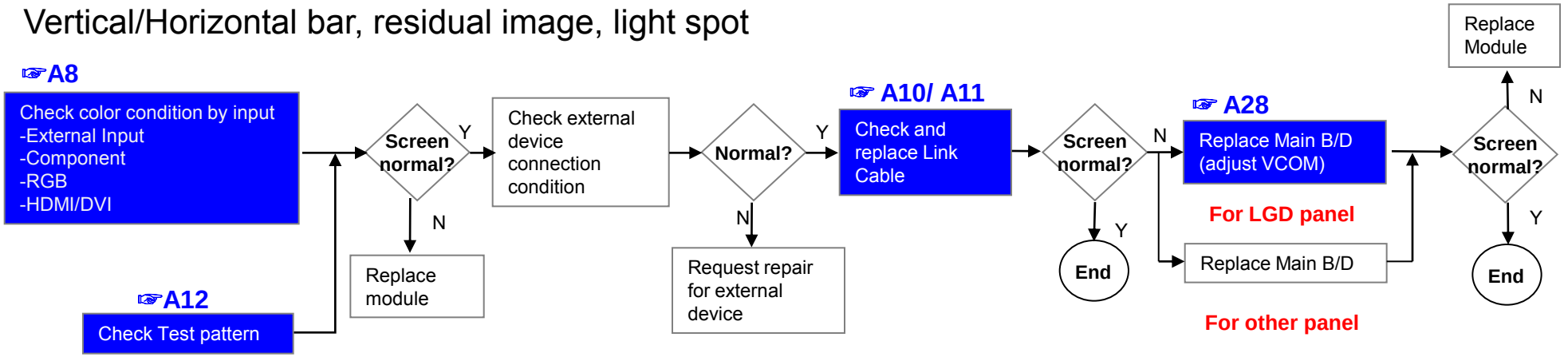
LCD TV	Error symptom	A. Video error	Established date	2012. 12 .06	
		Color error	Revised date		



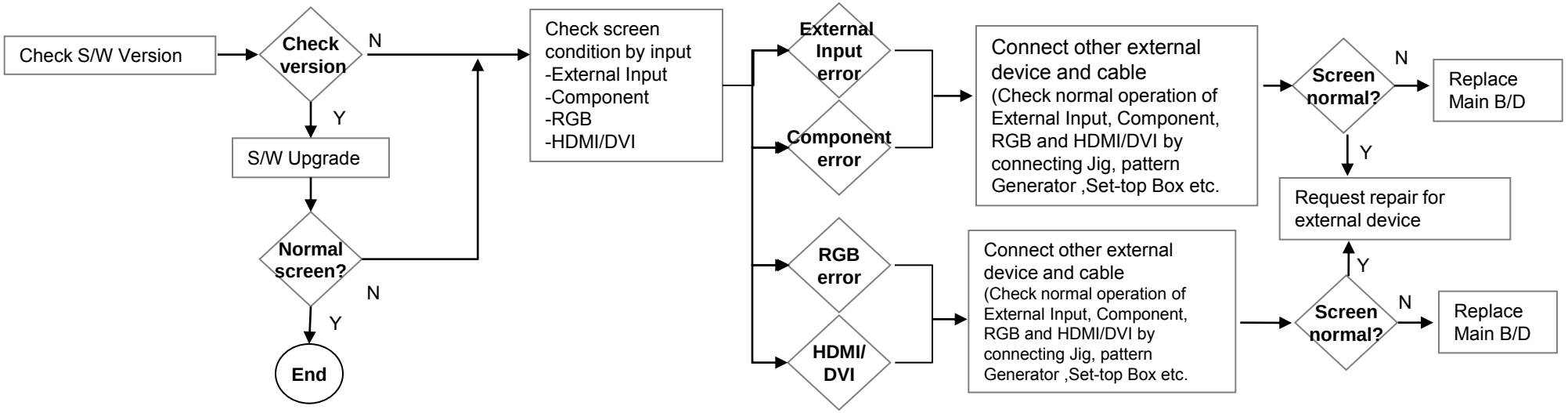
Standard Repair Process

LCD TV	Error symptom	A. Video error	Established date	2012. 12 .06	
		Vertical / Horizontal bar, residual image, light spot, external device color error	Revised date		

Vertical/Horizontal bar, residual image, light spot

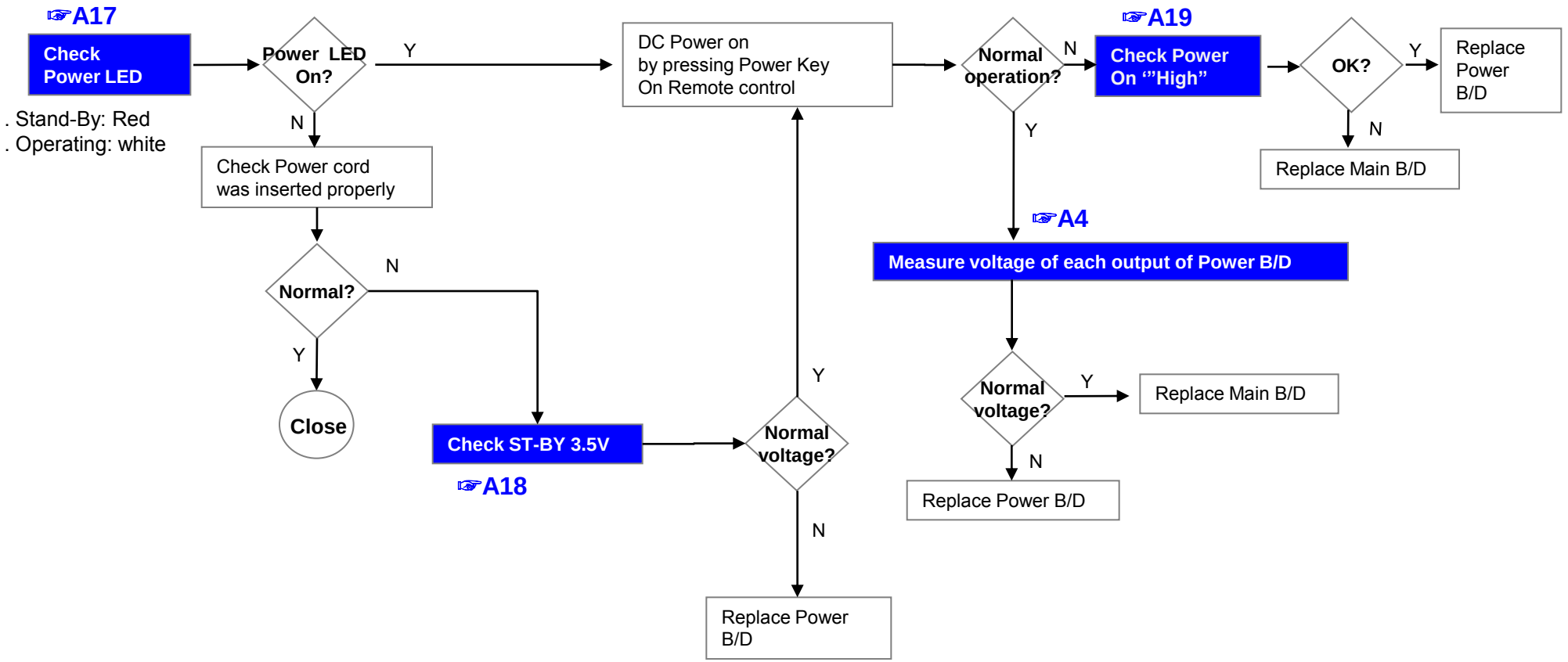


External device screen error-Color error



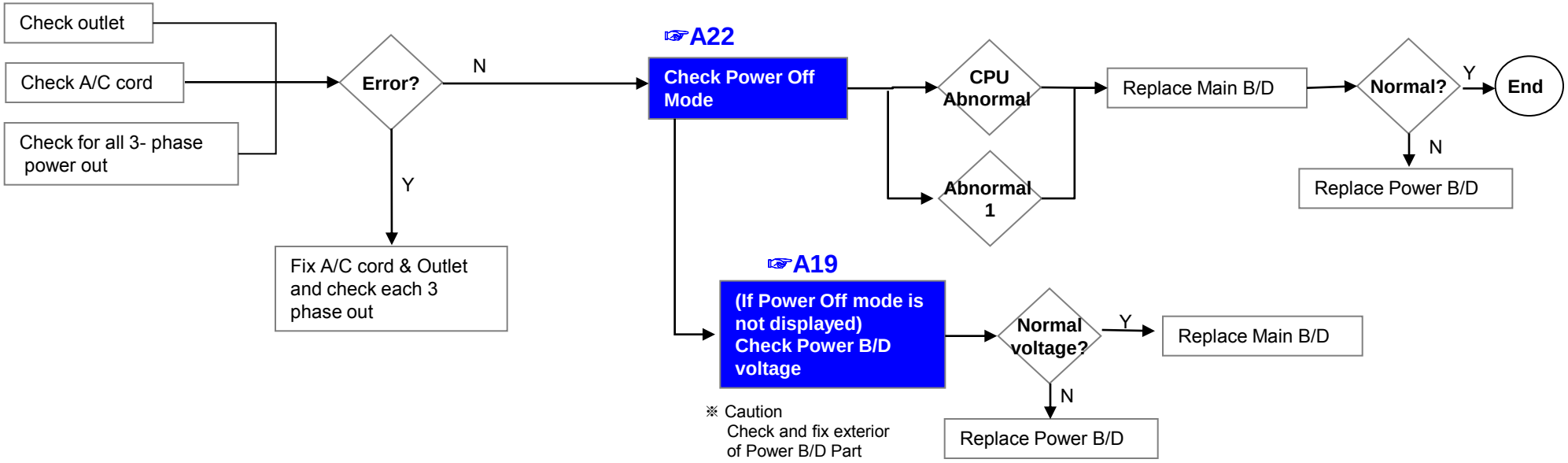
Standard Repair Process

LCD TV	Error symptom	B. Power error	Established date	2012. 12 .06	
		No power	Revised date		



Standard Repair Process

LCD TV	Error symptom	B. Power error	Established date	2012. 12 .06	
		Off when on, off while viewing, power auto on/off	Revised date		

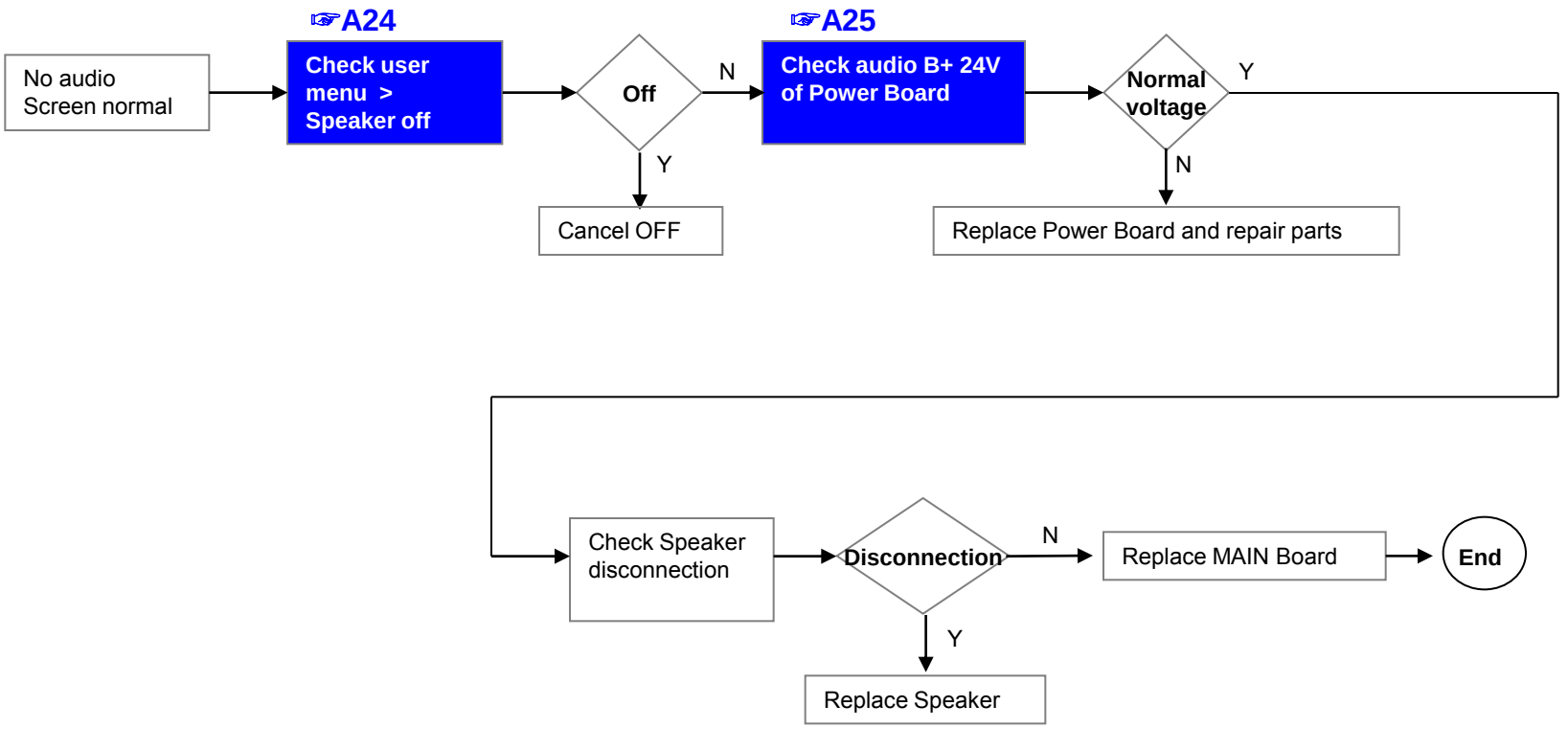


*** Please refer to the all cases which can be displayed on power off mode.**

Status	Power off List	Explanation
Normal	"POWEROFF_REMOTEKEY"	Power off by REMOTE CONTROL
	"POWEROFF_OFFTIMER"	Power off by OFF TIMER
	"POWEROFF_SLEEPTIMER"	Power off by SLEEP TIMER
	"POWEROFF_INSTOP"	Power off by INSTOP KEY
	"POWEROFF_AUTOOFF"	Power off by AUTO OFF
	"POWEROFF_ONTIMER"	Power off by ON TIMER
	"POWEROFF_RS232C"	Power off by RS232C
	"POWEROFF_RESREC"	Power off by Reservated Record
	"POWEROFF_RECEND"	Power off by End of Recording
	"POWEROFF_SWDOWN"	Power off by S/W Download
	"POWEROFF_UNKNOWN"	Power off by unknown status except listed case
Abnormal	"POWEROFF_ABNORMAL1"	Power off by abnormal status except CPU trouble
	"POWEROFF_CPUABNORMAL"	Power off by CPU Abnormal

Standard Repair Process

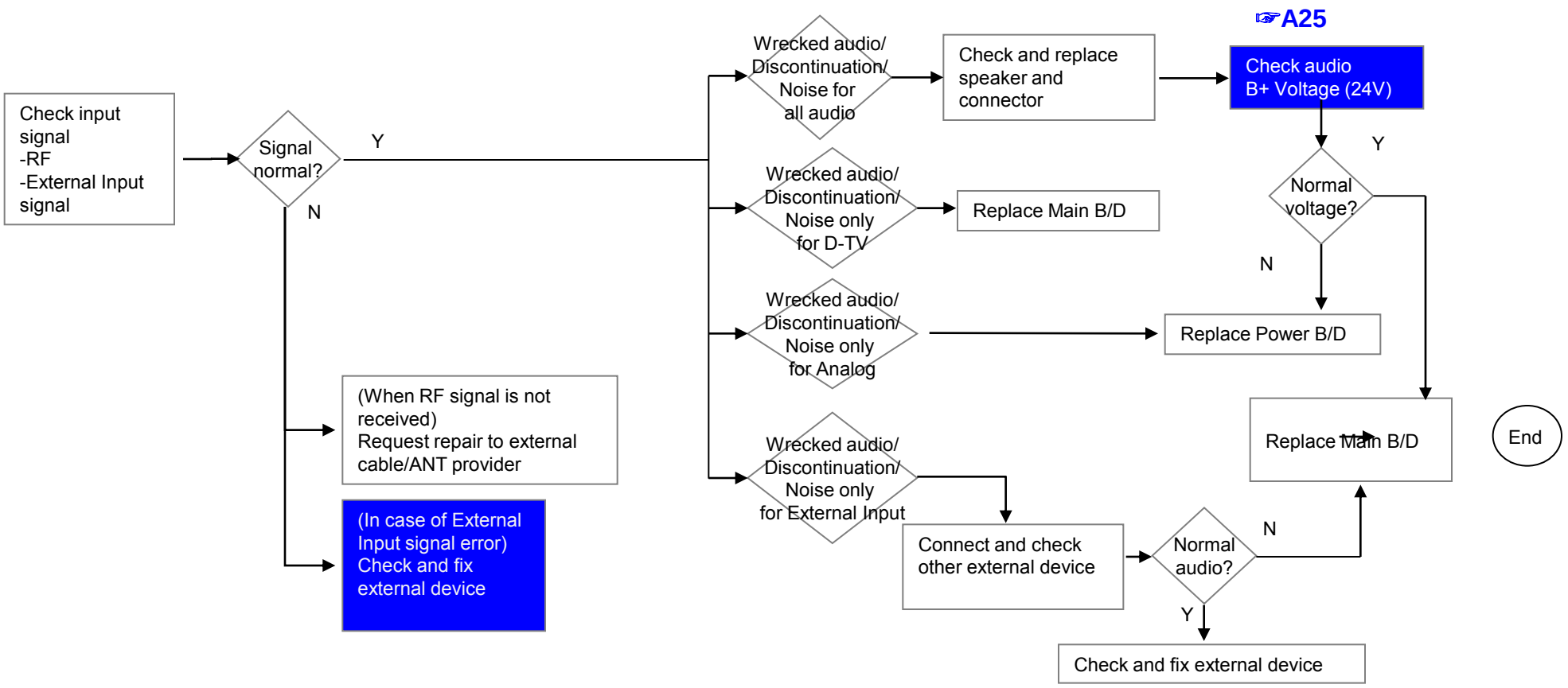
LCD TV	Error symptom	C. Audio error	Established date	2012. 12 .06	
		No audio/ Normal video	Revised date		



Standard Repair Process

LCD TV	Error symptom	C. Audio error	Established date	2012. 12 .06	
		Wrecked audio/ discontinuation/noise	Revised date		

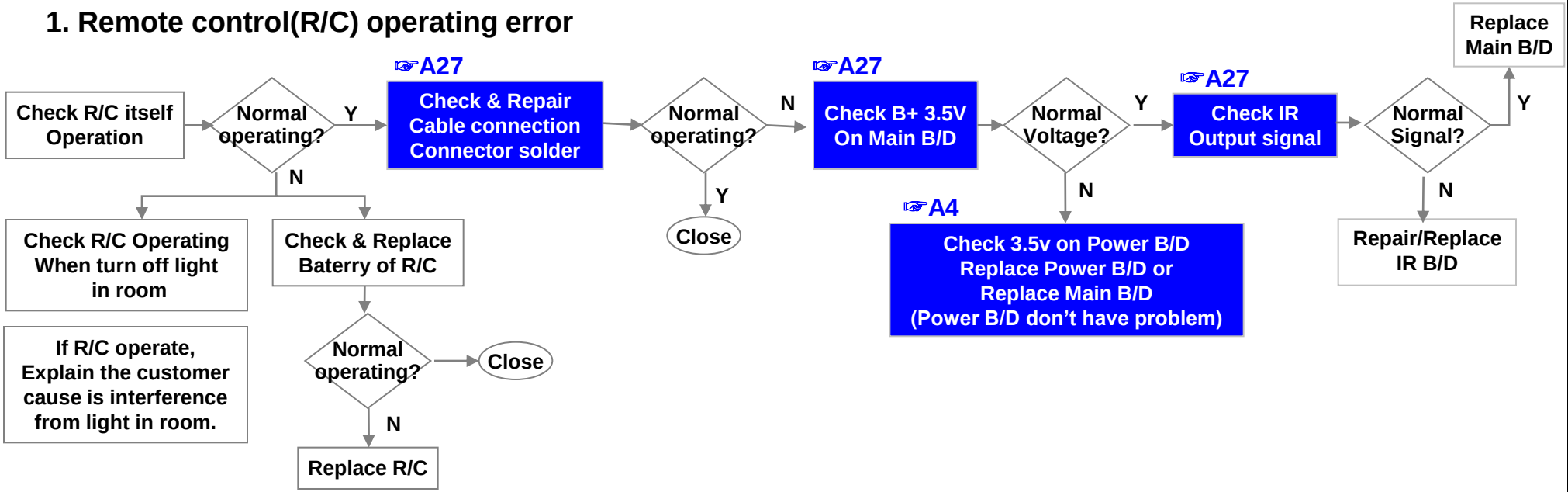
→ abnormal audio/discontinuation/noise is same after "Check input signal" compared to No audio



Standard Repair Process

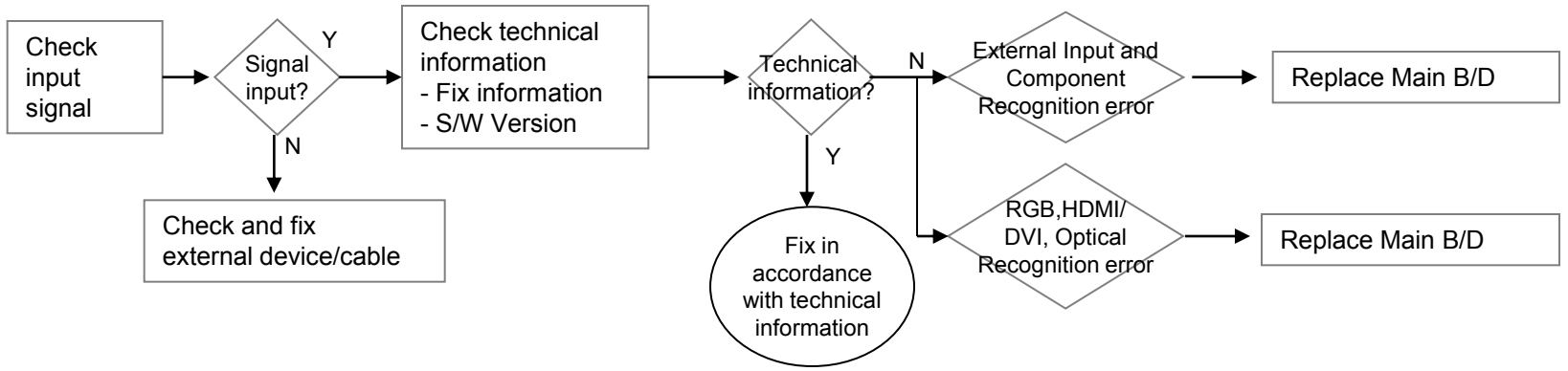
LCD TV	Error symptom	D. General Function Problem	Established date	2012. 12 .06	
		Remote control & Local switch checking	Revised date		

1. Remote control(R/C) operating error



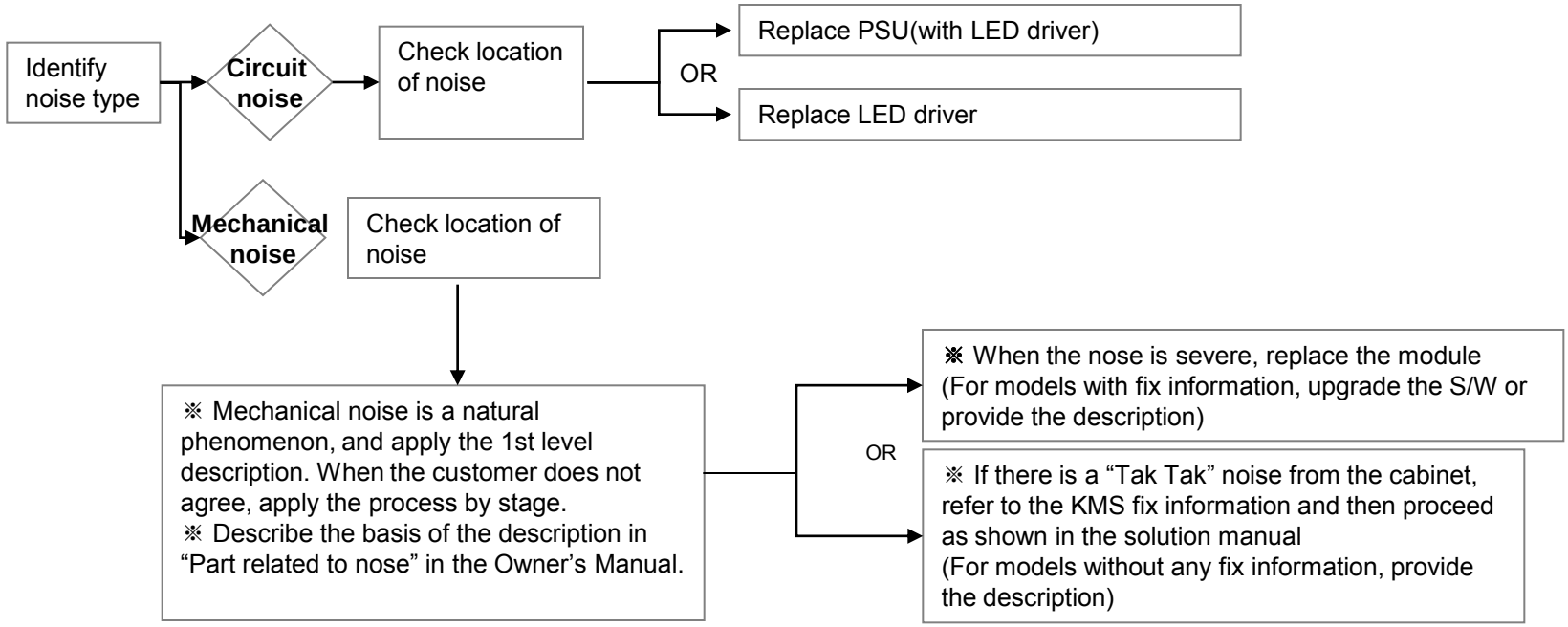
Standard Repair Process

LCD TV	Error symptom	D. Function error	Established date	2012. 12 .06	
		External device recognition error	Revised date		



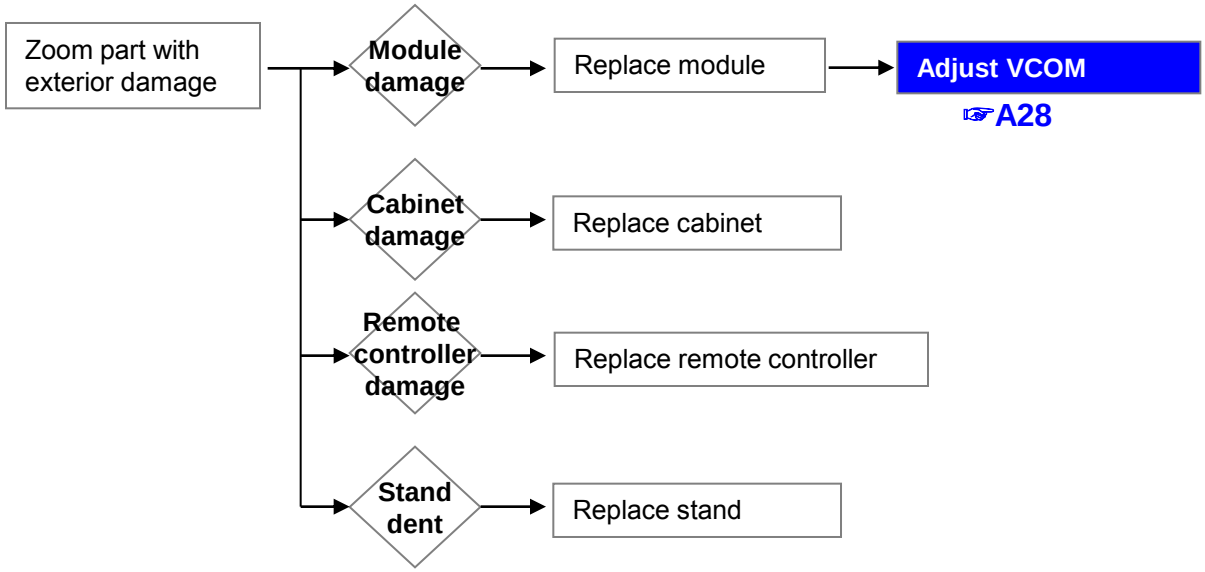
Standard Repair Process

LCD TV	Error symptom	E. Noise	Established date	2012. 12 .06	
		Circuit noise, mechanical noise	Revised date		


Identify noise type
Circuit noise
Check location of noise
OR
Replace PSU(with LED driver)
Replace LED driver
Mechanical noise
Check location of noise
※ Mechanical noise is a natural phenomenon, and apply the 1st level description. When the customer does not agree, apply the process by stage.
※ Describe the basis of the description in “Part related to nose” in the Owner’s Manual.
OR
※ When the nose is severe, replace the module (For models with fix information, upgrade the S/W or provide the description)
※ If there is a “Tak Tak” noise from the cabinet, refer to the KMS fix information and then proceed as shown in the solution manual (For models without any fix information, provide the description)

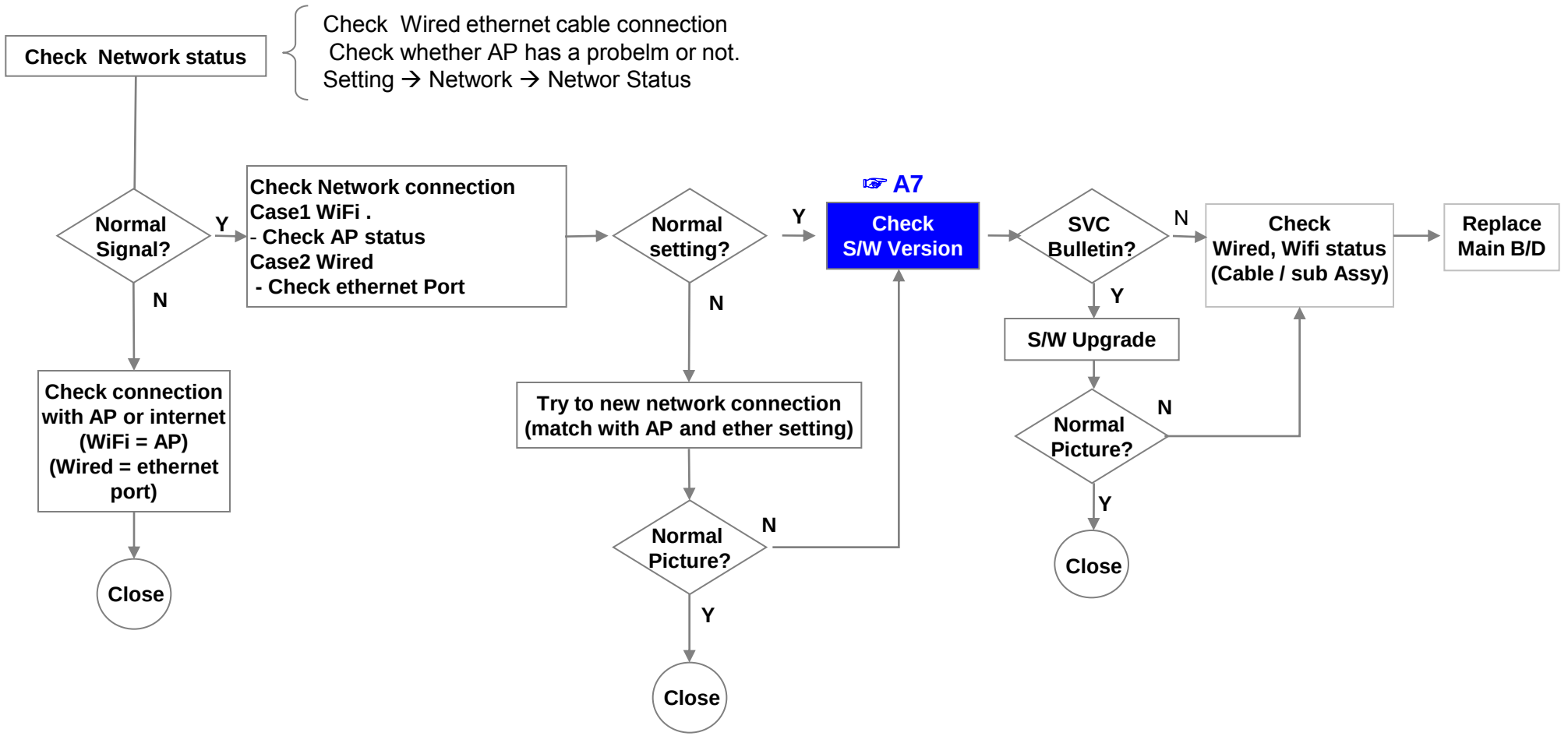
Standard Repair Process

LCD TV	Error symptom	F. Exterior defect	Established date	2012. 12 .06	
		Exterior defect	Revised date		



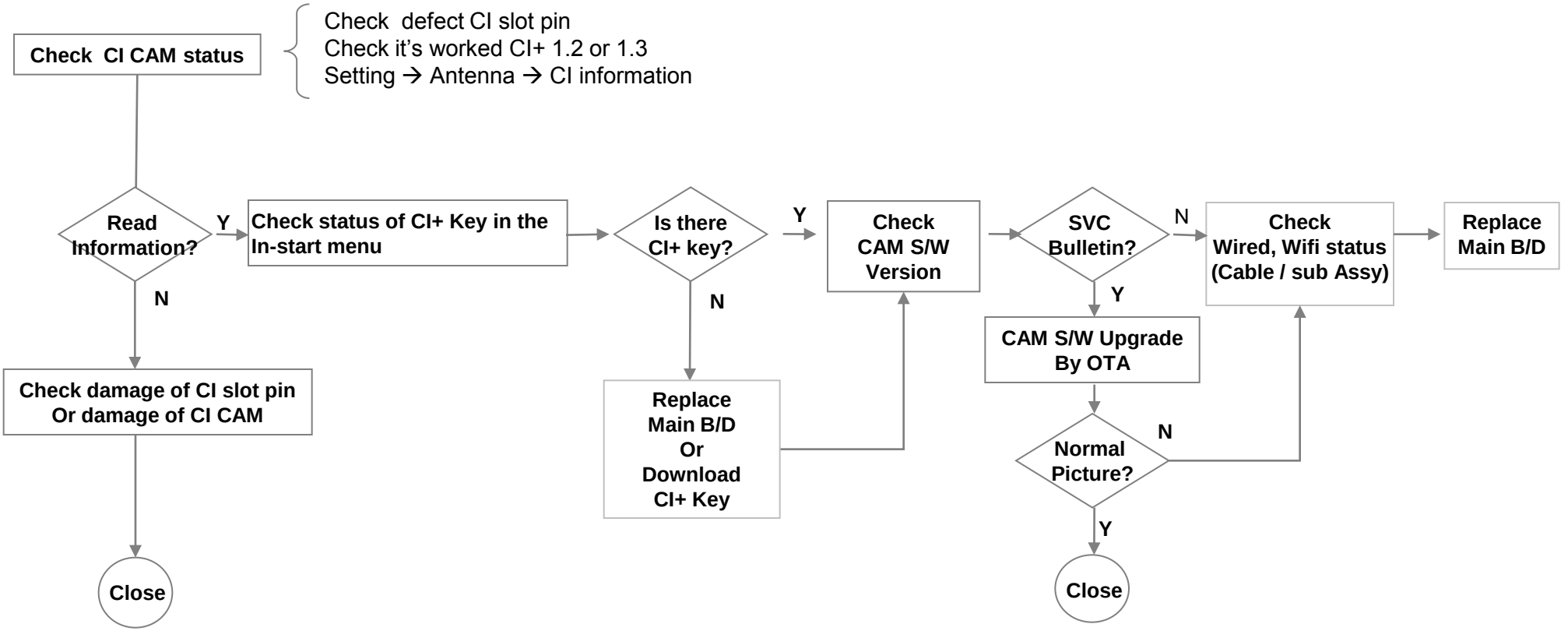
Standard Repair Process

LCD TV	Error symptom	G. Network Error	Established date	2012. 12 .06	
		Exterior defect	Revised date		



Standard Repair Process

LCD TV	Error symptom	G. CI+ Competibility Error	Established date	2012. 12 .06	
		Exterior defect	Revised date		



Old version of CI+ 1.2 CAM is not worked at the TV that is supported CI+ 1.3
➔ Check SVC Bulletin

Contents of LCD TV Standard Repair Process Detail Technical Manual

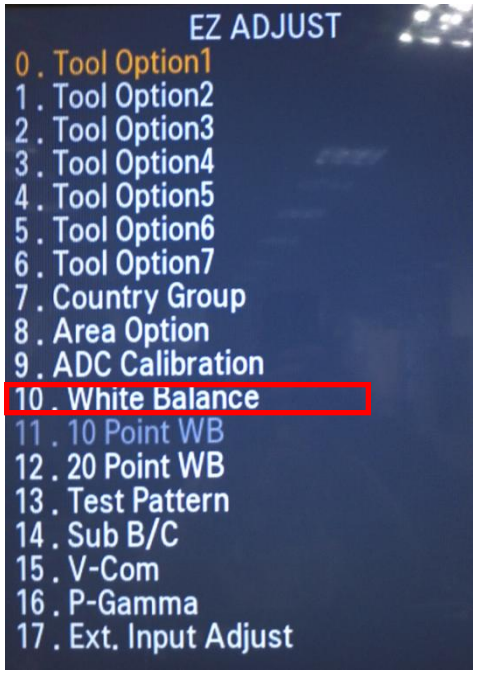
Continued from previous page

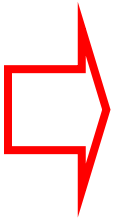
No.	Error symptom	Content	Page	Remarks
21	B. Power error_No power	Check front display LED	A17	
22		Check power input Voltage & ST-BY 3.5V	A18	
23		Checking method when power is ON	A19	
24		POWER BOARD voltage measuring method	A5	
25				
26	B. Power error_Off when on, off while viewing	POWER OFF MODE checking method	A22	
27	B. Power error_Off when on, off while viewing	POWER BOARD PIN voltage checking method	A19	
28	C. Audio error_No audio/Normal video	Checking method in menu when there is no audio	A24	
29		Voltage and speaker checking method when there is no audio	A25	
30	C. Audio error_Wrecked audio/discontinuation	Voltage and speaker checking method in case of audio error	A25	
31	D. Function error_ No response in remote controller, key error	Remote controller operation checking method	A27	
32	D. VCOM Adjustment	Sequence of the Vcom adjustment	A28	

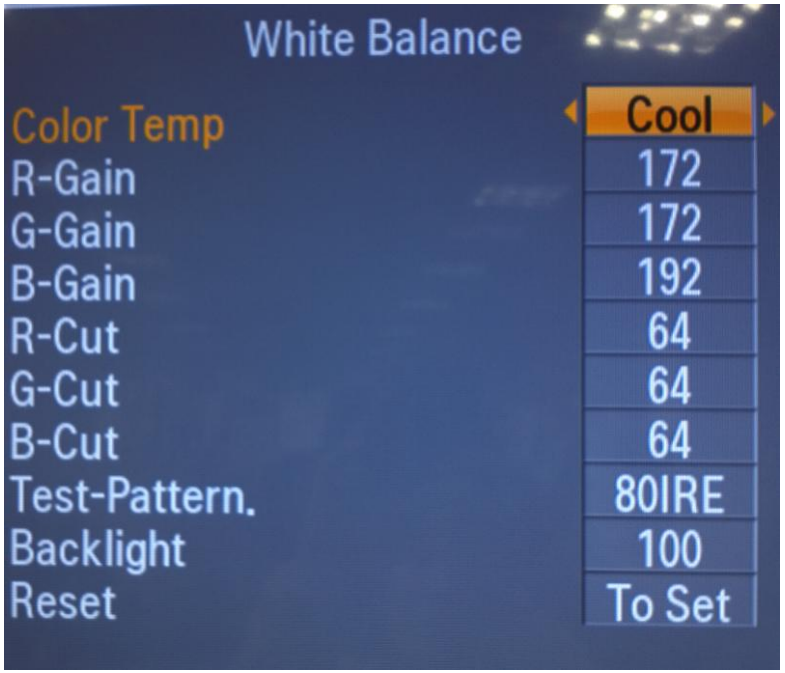
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2012. 12 .06	
	Content	Check White Balance value	Revised date		A4

<ALL MODELS>







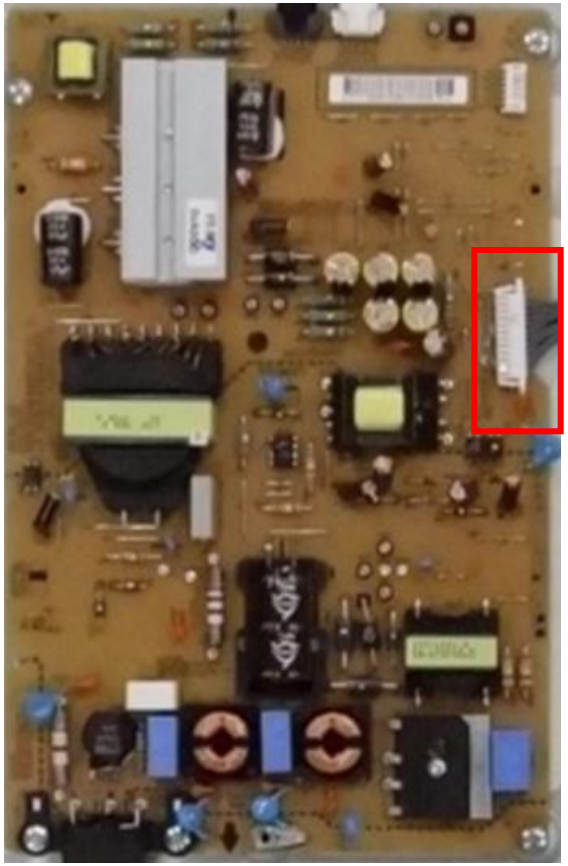
Entry method

1. Press the ADJ button on the remote controller for adjustment.
2. Enter into White Balance of item 10.
3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), re-enter the value after replacing the MAIN BOARD.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/ Audio	Established date	2012. 12 .06	
	Content	Power Board voltage measuring method	Revised date		A5

Check the DC 24V, 12V, 3.5V.

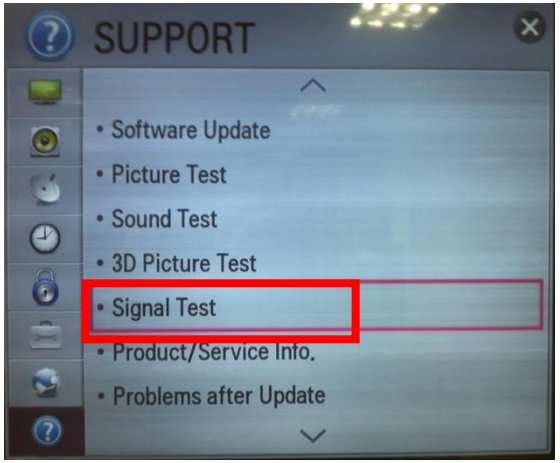


24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

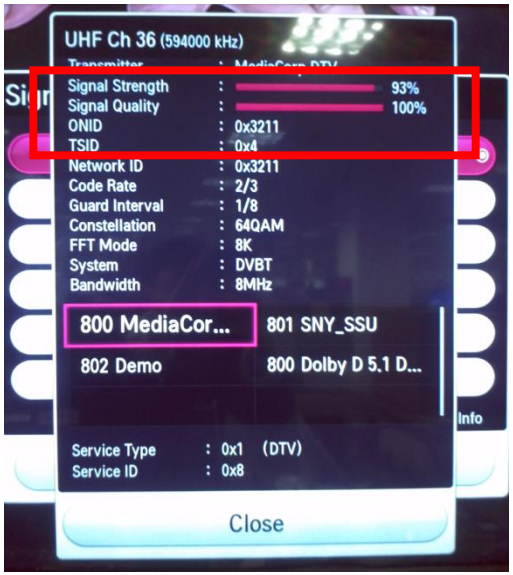
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2012. 12 .06	
	Content	TUNER input signal strength checking method	Revised date		A6

<ALL MODELS>



MENU → support → signal test
→ select channel



When the signal is strong, use the attenuator (-10dB, -15dB, -20dB etc.)

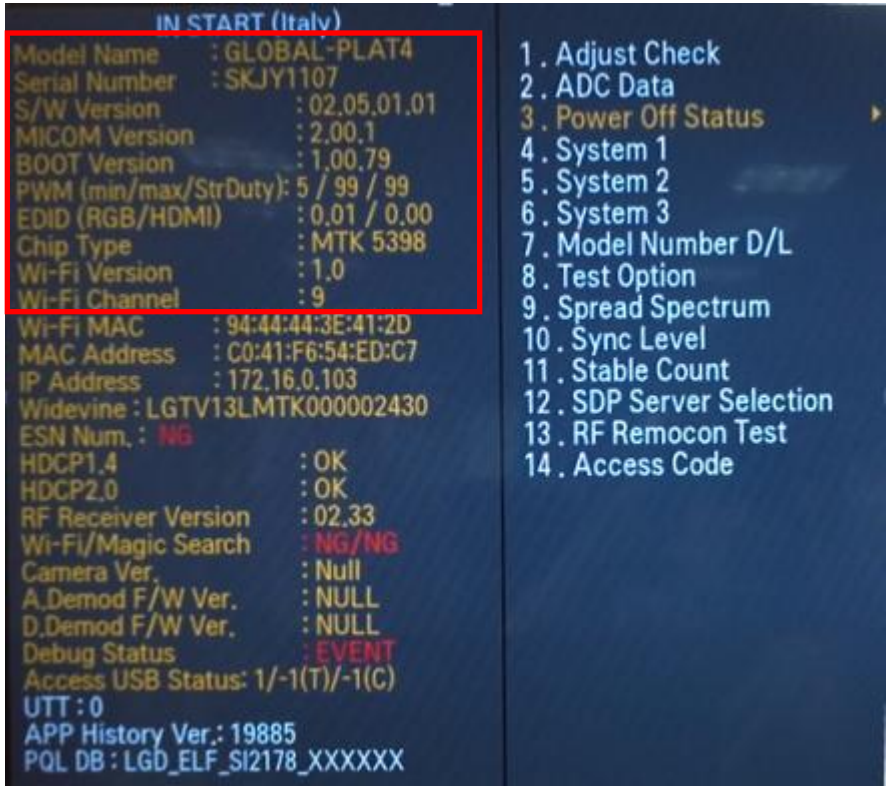
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2012. 12 .06	
	Content	LCD-TV Version checking method	Revised date		A7

<ALL MODELS>

1. Checking method for remote controller for adjustment

Version


IN START (Italy)
Model Name : GLOBAL-PLAT4
Serial Number : SKJY1107
S/W Version : 02.05.01.01
MICOM Version : 2.00.1
BOOT Version : 1.00.79
PWM (min/max/StrDuty): 5 / 99 / 99
EDID (RGB/HDMI) : 0.01 / 0.00
Chip Type : MTK 5398
Wi-Fi Version : 1.0
Wi-Fi Channel : 9
Wi-Fi MAC : 94:44:44:3E:41:2D
MAC Address : C0:41:F6:54:ED:C7
IP Address : 172.16.0.103
Widevine : LGTV13LMTK000002430
ESN Num. : NG
HDCP1.4 : OK
HDCP2.0 : OK
RF Receiver Version : 02.33
Wi-Fi/Magic Search : NG/NG
Camera Ver. : Null
A.Demod F/W Ver. : NULL
D.Demod F/W Ver. : NULL
Debug Status : EVENT
Access USB Status: 1/-1(T)/-1(C)
UTT : 0
APP History Ver.: 19885
POL DB : LGD_ELF_SI2178_XXXXXX
1 . Adjust Check
2 . ADC Data
3 . Power Off Status
4 . System 1
5 . System 2
6 . System 3
7 . Model Number D/L
8 . Test Option
9 . Spread Spectrum
10 . Sync Level
11 . Stable Count
12 . SDP Server Selection
13 . RF Remocon Test
14 . Access Code

Press the IN-START with the remote controller for adjustment

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error _Vertical/Horizontal bar, residual image, light spot	Established date	2012. 12 .06	
	Content	LCD TV connection diagram (1)	Revised date		A8

<ALL MODELS>

As the part connecting to the external input, check the screen condition by signal

Standard Repair Process Detail Technical Manual

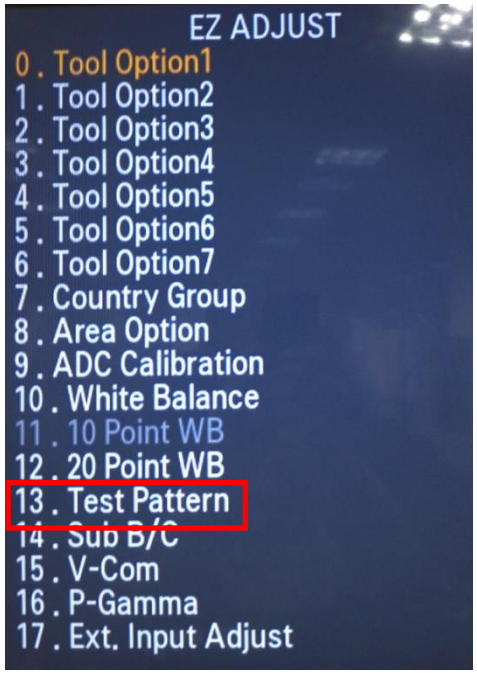
LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2012. 12 .06	
	Content	TUNER checking part	Revised date		A9

<ALL MODELS>

Checking method:
1. Check the signal strength or check whether the screen is normal when the external device is connected.
2. After measuring each voltage from power supply, finally replace the MAIN BOARD.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Color error	Established date	2012. 12 .06	
	Content	Adjustment Test pattern - ADJ Key	Revised date		A12

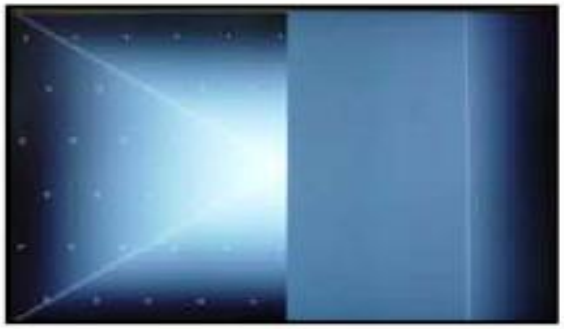


You can view 6 types of patterns using the ADJ Key

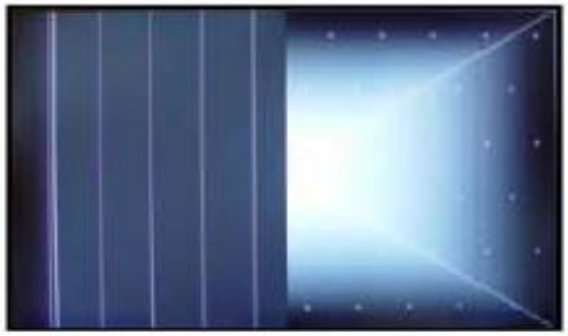
Checking item : 1. Defective pixel 2. Residual image 3. MODULE error (ADD-BAR,SCAN BAR..)
4.Video error (Classification of MODULE or Main-B/D!)

Appendix : Exchange EPI Cable or Main B/D (1)

Solder defect, CNT Broken

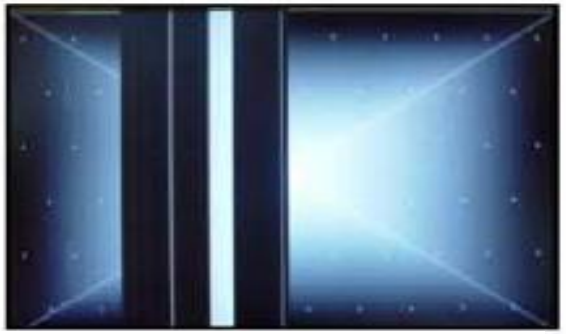


Solder defect, CNT Broken



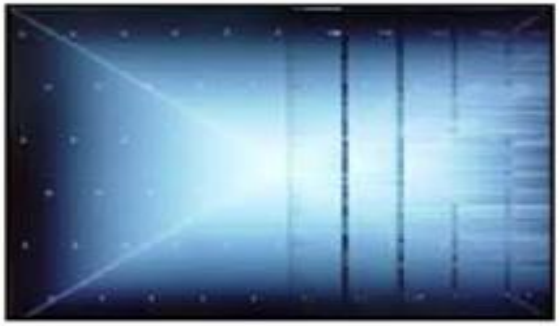
Solder defect, CNT Broken

Solder defect, CNT Broken



Solder defect, CNT Broken

Abnormal Power Section

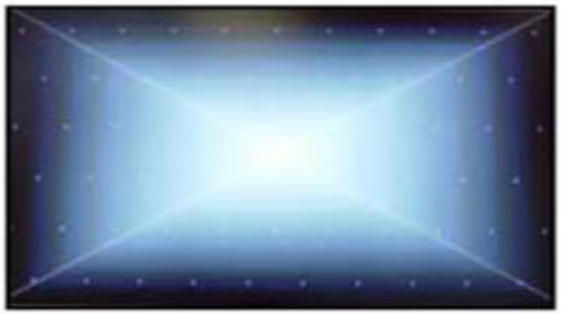


Solder defect, Short/Crack

Abnormal Power Section

Solder defect, Short/Crack

Appendix : Exchange EPI Cable or Main B/D (2)



Abnormal Power Section

Abnormal Power Section

Solder defect, Short/Crack

Solder defect, Short/Crack

Fuse Open, Abnormal power section

Abnormal Display

GRADATION

Noise

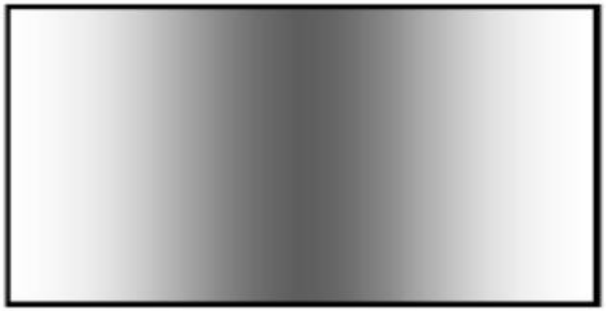
GRADATION

Appendix : Exchange LPB(LED driver)

No Light

Dim Light

Dim Light



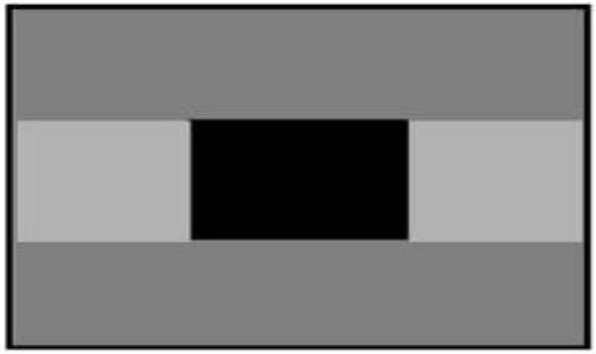
Dim Light

Appendix : Exchange the Module (1)

Panel Mura, Light leakage

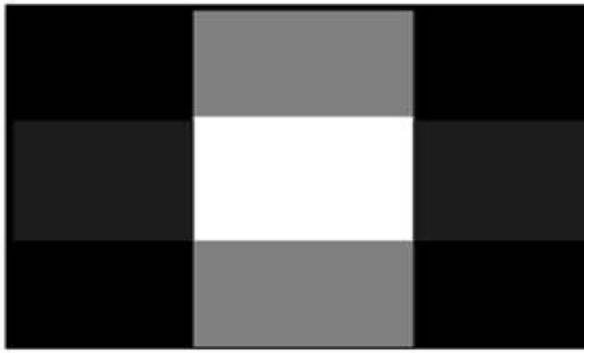
Panel Mura, Light leakage

Press damage



Crosstalk

Press damage



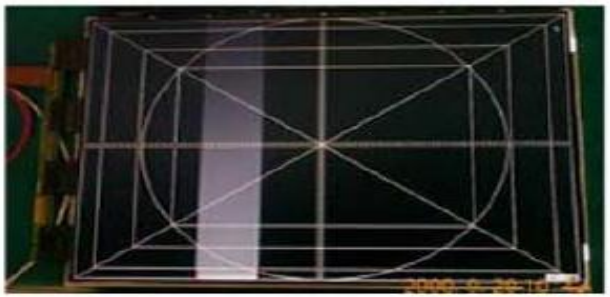
Crosstalk

Press damage

Un-repairable Cases

In this case please exchange the module.

Appendix : Exchange the Module (2)

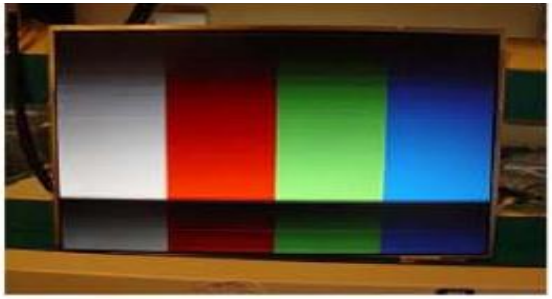


Vertical Block
Source TAB IC Defect

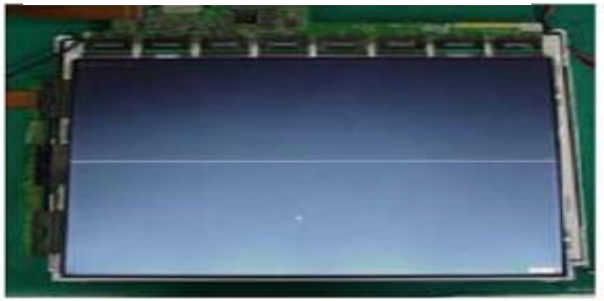
Vertical Line
Source TAB IC Defect

Vertical Block
Source TAB IC Defect

Horizontal Block
Gate TAB IC Defect



Horizontal Block
Gate TAB IC Defect



Horizontal line
Gate TAB IC Defect

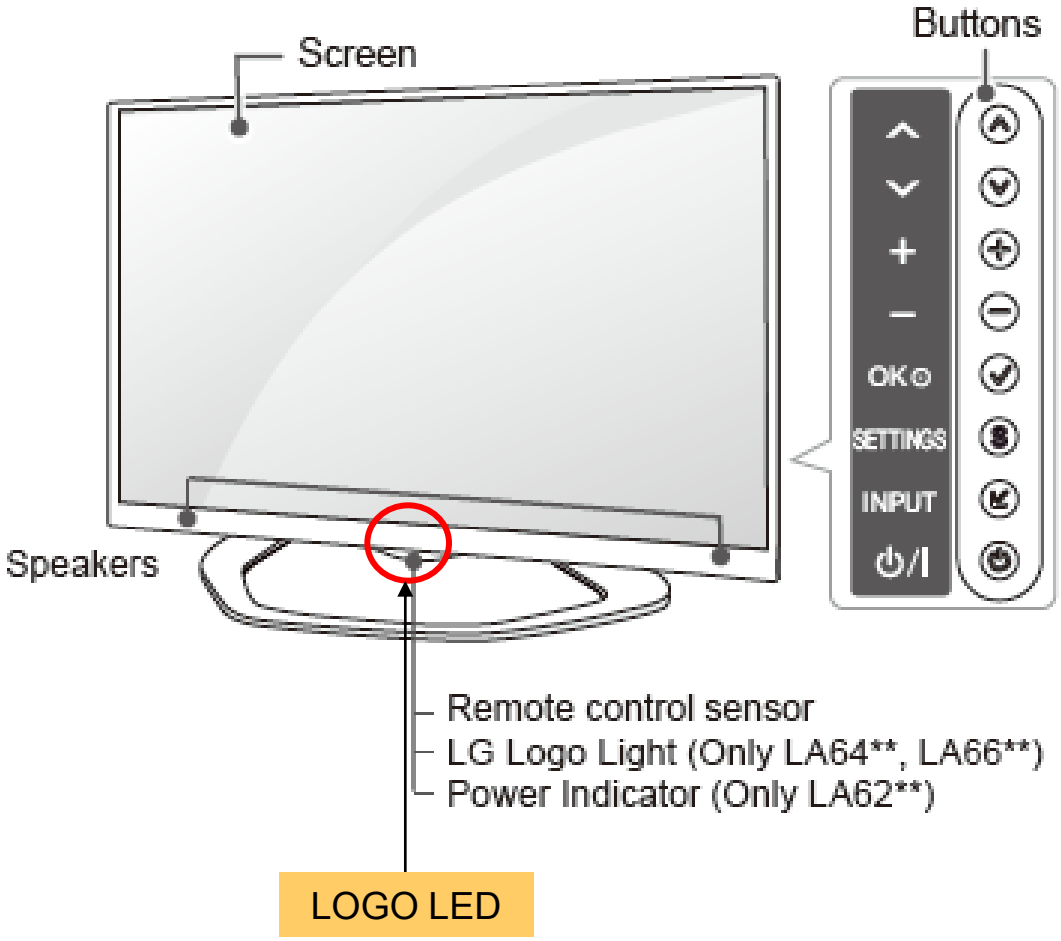
Horizontal Block
Gate TAB IC Defect

Un-repairable Cases

In this case please exchange the module.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2012. 12 .06	
	Content	Check front display LED	Revised date		A17



You can set the LG Logo Light to on or off by selecting OPTION in the main menus.

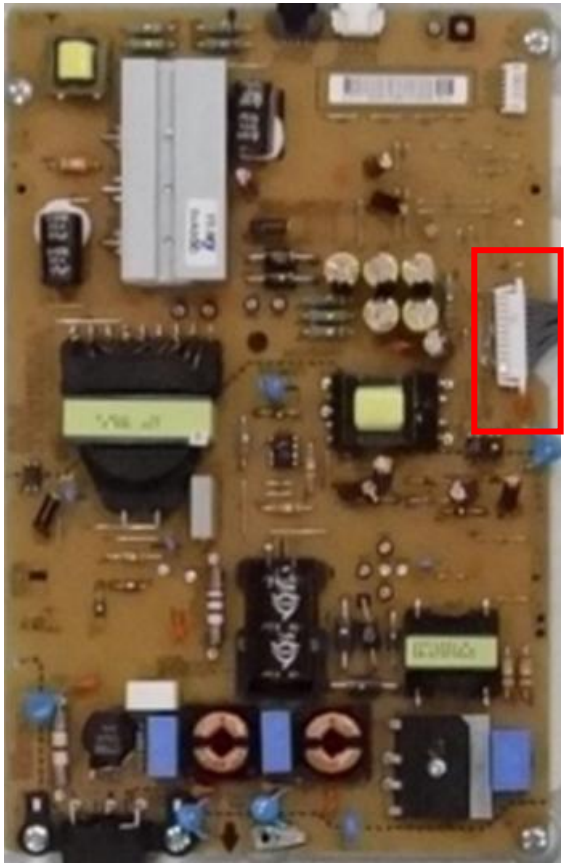
Front LOGO LED control in the status of ST-BY Condition:
Menu → Option → LG Logo Light → Brightness(OFF,LOW,MIDDLE,HIGH)

Front LOGO LED control in the status of Power On Condition:
Menu → Option → LG Logo Light → Duration(off, off after10min)

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2012. 12 .06	
	Content	Check power input voltage and ST-BY 3.5V	Revised date		A18

For ’10 models, there is no voltage out for st-by purpose.
When st-by, only 3.5V is normally on.

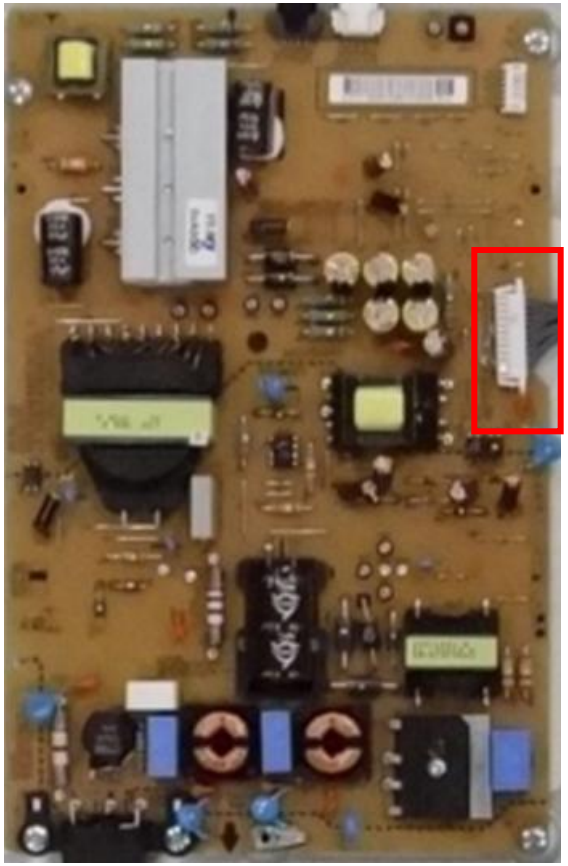


Check the DC 24V, 12V, 3.5V.

24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2012. 12 .06	
	Content	Checking method when power is ON	Revised date		A19



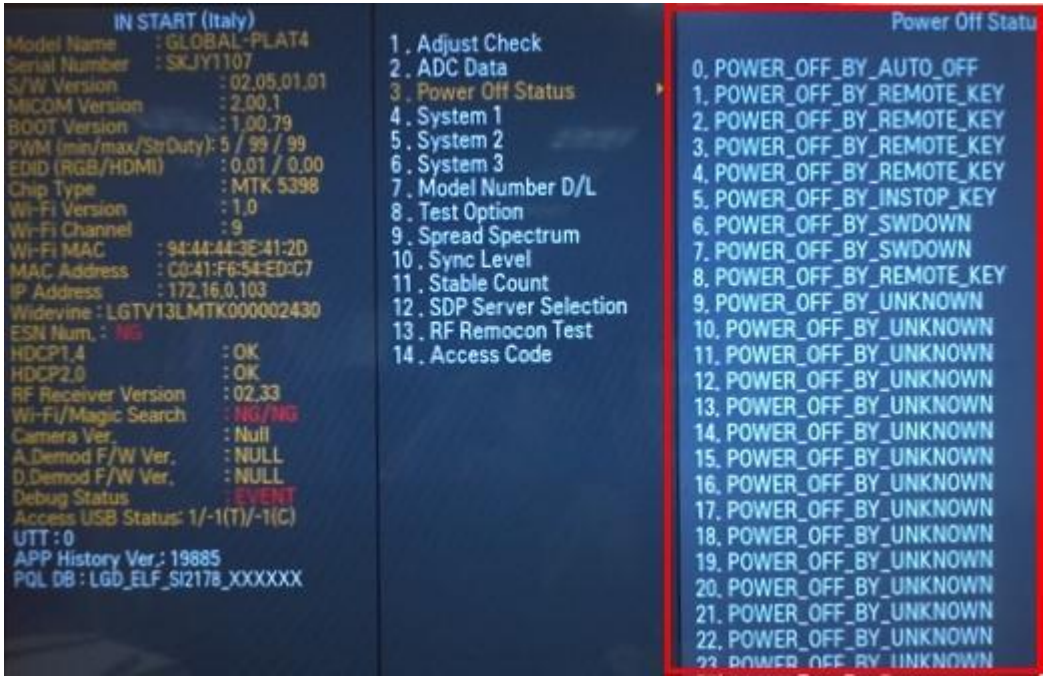
Check “power on” pin is high

24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _Off when on, off whiling viewing	Established date	2012. 12 .06	
	Content	POWER OFF MODE checking method	Revised date		A22

<ALL MODELS>



Entry method

1. Press the IN-START button of the remote controller for adjustment

2. Check the entry into adjustment item 3

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2012. 12 .06	
	Content	Checking method in menu when there is no audio	Revised date		A24

<ALL MODELS>

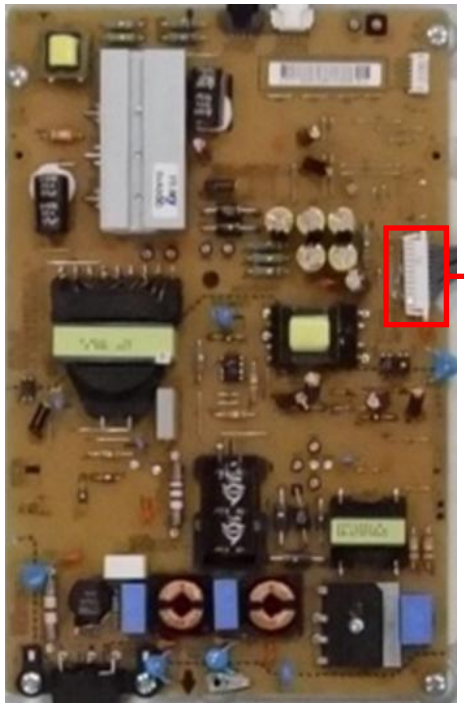
Checking method

1. Press the MENU button on the remote controller
2. Select the SOUND function of the Menu
3. Change TV Sound Out to TV Speaker

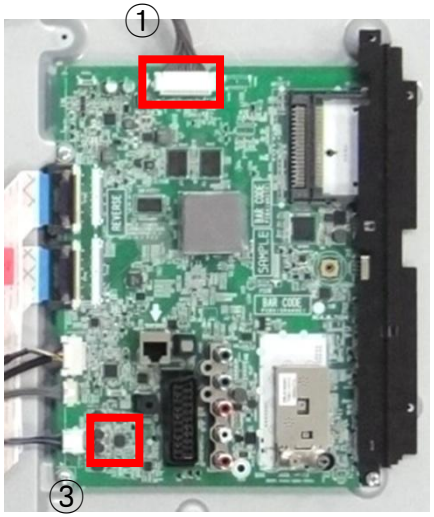
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2012. 12 .06	
	Content	Voltage and speaker checking method when there is no audio	Revised date		A25

<ALL MODELS>



24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7 ②	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK



Checking order when there is no audio

① Check the contact condition of or 24V connector of Main Board

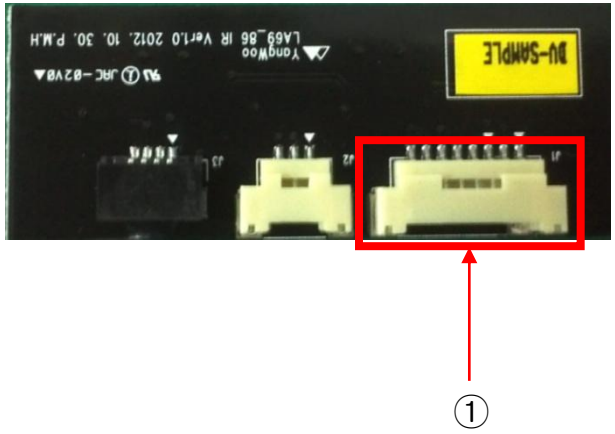
② Measure the 24V input voltage supplied from Power Board
(If there is no input voltage, remove and check the connector)

③ Connect the tester RX1 to the speaker terminal and if you hear the Chik Chik sound when you touch the GND and output terminal, the speaker is normal.

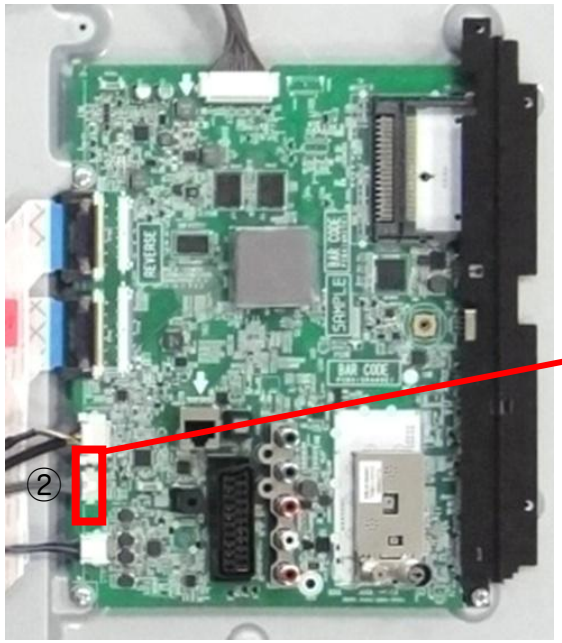
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	D. Function error_ No response in remote controller, key error	Established date	2012. 12 .06	
	Content	Remote controller operation checking method	Revised date		A27

<ALL MODELS>



①



②

	P4101	
	1	GND
	2	KEY1
	3	KEY2
③	4	+3.5V_ST
	5	GND
	6	LOGO/LED_R
④	7	IR
	8	GND

Checking order

1, 2. Check IR cable condition between IR & Main board.
3. Check the st-by 3.5V on the terminal 4.
4. When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	D. VCOM Adjustment	Established date	2012. 12 .06	
	Content	Sequence of the Vcom adjustment	Revised date		A28

1. Case

■ LCD module change
■ T-Con board change

2. Equipment

■ Service Remote controller

3. Adjust sequence

■ Press the ‘adj’ key
■ select V-COM
■ As pushing the right or the left button on the remote controller, And find the V-COM value Which is no or minimized the Flicker.
(If there is no flicker at default value, Press the exit key and finish the VCOM adjustment.)
■ Push the OK key to store the value. Then the message “Saving OK” is pop.
■ Press the exit key to finish V-COM adjustment.